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APPENDIX TO THE JOURNALS
OF THE
SENATE AND ASSEMBLY

OF THE
TWENTY-SIXTH SESSION
OF THE
LEGISLATURE OF THE STATE OF CALIFORNIA.

Volume V.



SACRAMENTO:
STATE OFFICE JAMES J. AYERS, SUPT. STATE PRINTING.
1885.

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PREFACE.

To the Board of State Viticultural Commissioners :

GENTLEMEN: The first annual report of my office for the year 1881, was intended to be the first of a series to be published annually, but the complicated condition in which I have found the many subjects which required careful study, has involved my work so much that I have delayed the issuance of a second volume until I have become better prepared to lay before the public the results of investigations in such a form as may be of the most lasting and practical value to the State. The present volume will be styled my "second annual report," covering, however, the work of the years 1882-3 and 1883-4, not including, however, the period of vintage of this year.

In the following chapters I have endeavored to be as concise in statement as possible, without, however, sacrificing substance to brevity. Comments and criticism upon all points are solicited from all competent persons, with a view to any future modifications of opinion, revision, or correction that may prove necessary.

Appendices I, II, and III to this report have been issued in advance, in order to prepare the way for discussion of principles of pruning and grafting as illustrated by the experience of our vine-growers.

The press of the State has also been kindly disposed in printing a collection of notes, which I had prepared as test studies of prominent varieties of vines now cultivated in our vineyards, and which are now revised, enlarged, and incorporated with other topics of importance.

I desire to acknowledge my grateful appreciation of the assistance which has been rendered in so far completing this work, by the many sincere and practical viticulturists of the State, who realize both the great difficulty and the increasing value of harmonizing the many apparently contradictory experiences, which are encountered in our great State, owing to varying conditions of climate, soil, and culture. This Commission will be always indebted, for whatever good reputation it acquires as a promoter of the cause of viticulture, to the

cordial and sympathetic coöperation of the great body of the vine-growers and merchants who are interested in our success. The unity and harmony, which marks our progress, is a proper cause for mutual congratulation, and proves a source of encouragement in labors which would otherwise be of little profit to the commonwealth. In return for the generous contributions which are freely offered from the stores of individual experience for the benefit of the public, I sincerely hope that the results of my compilations and studies may prove of some real value to each and all. In like spirit I trust that the State may reap a hundred-fold in harvesting the fruits of its liberal appropriations. When the test of patriotic action is called for, the viticulturists of California will be found among the foremost citizens, true to the people and strong in their prosperity.

We owe much, also, to the generous and noble efforts of distinguished co-workers in other countries. The viticultural literature of the old world is to this generation of almost priceless value. Careful study and research may soon place us side by side with European progress, and in the near future we may be able to contribute our share to add to the common stock of knowledge, thus in a measure paying our debts to practical experience and science. All civilized nations have fostered viticulture wherever practicable; and this country will not borrow where it will not lend.

The Roman Empire once foolishly attempted to crush the industry in Gaul, but the vine was twined in the hearts of the people, and was stronger than statecraft.

On this coast the vine came in with the first attempts in civilization; our history will know nothing older than the vineyard.

In this connection, I should not be true to the record of the last two years if I omitted to notice one important effort in opposition to our work. I refer to the action of certain ecclesiastical societies, which provoked a reply at our first annual State Viticultural Convention, held in San Francisco in September, 1882. At that time I read and commented upon the following extract, taken from one of the local papers:

THE CHURCHES AND VINICULTURE.

Rev. T. H. Woodward, in a long and elaborate article in the *Christian Advocate*, shows a great degree of unanimity on the part of the churches of several denominations in opposition to viniculture, which he regards as California's great peril. The recent meeting of Presbyterian ministers at Sacramento, he says, passed a series of very strong resolutions in favor of the Sunday law, and in opposition to the manufacture, sale, and use of wine, etc., as a beverage. In like manner the last General Association of the Congregational Church resolved: "That we recognize the manufacture of wine and brandy from grapes as one of the greatest evils with which the Christian religion has to contend in California, and that the raising of grapes for this purpose is demoralizing to the best interests of the State; also, that we recommend all members of our churches to abstain from engaging in the business." So, also, at the last Methodist Episcopal Conference, which was held at Sacramento, the following resolution was passed by a unanimous vote:

"Resolved, That making brandy and intoxicating wine from the grape is a perversion fraught with measureless mischief and danger, and we respectfully but emphatically record our protest against the maintenance of a salaried commission to promote such a perversion, as an invidious discrimination in favor of an illusory and perilous industry, encouraging it by insidious, uninformed, and unstatesmanlike action, and swelling its yield of bitter fruits of debauchery, pauperism, and crime."

I deem it proper in this report to say that these ignorantly conceived attacks were vigorously resented, and that the wisdom of the State in fostering viticulture was defended by our prompt action. As the vine survived the crushing power of one Roman Emperor, afterwards to become the handmaid of the church in its foreign missions, so may we predict that it will ages hence flourish green over the grave of the ignorant intolerance that actuated those who uttered the vain, wicked, and untrue words quoted above. As we may hope to see these religious bodies progressing as in the past, with the growth of intelligence and that kindly spirit of humanity which gives force to science, we may predict that the happy results of our industry will silently and resistlessly force these evil opinions to fall into the shade of time, together with other relics of ecclesiastical pessimism, born of similar conceptions of human kind. Let this record challenge the history of the past and of the future for the vindication of viticulture.

In concluding these prefatory remarks, permit me also to thank the honorable members of this Commission for the many evidences of their continued confidence and the distinguished honors which I have received at their hands.

CHARLES A. WETMORE,
Chief Executive Viticultural Officer.

SAN FRANCISCO, September 1, 1884.

SECOND ANNUAL REPORT
OF THE
CHIEF EXECUTIVE VITICULTURAL OFFICER.

PART I.

ORIGINAL INVESTIGATIONS UNDER CHARGE OF THE
CHIEF EXECUTIVE VITICULTURAL OFFICER.

THE PHYLLOXERA.—During the Summer of 1882, the work of ascertaining to what extent the *phylloxera vastatrix* had become established in the State was continued. The results of previous examinations have already been published. In addition to the sections found infected in the Counties of Napa, Sonoma, Solano, Yolo, Sacramento, San Joaquin, Placer, and El Dorado, three spots were discovered in Santa Clara and one in Alameda, the latter being at the experimental vineyard of the State University at Berkeley. Where they had been previously examined, a steady but comparatively slow progress was noted. The advance was greatest in shallow and poor soils, overlying impervious subsoils, and in places where subdrainage was imperfect; also, in those black clay or adobe soils which are subject to shrinkage or cracking in Summer. The seasons of 1882 and 1883, being drier than usual, appeared to favor the development of the pest. The winged female was discovered in several places, and as the direction of progress was noticeable principally in the current of prevailing Summer winds, it was considered well established that the new spots were started by the lodging of this form of the insect. Many experiments were made to entrap the winged female as it came from the ground, but without success. It became apparent, therefore, that the infrequency of their development accounted for the comparatively slow progress that had been theretofore reported. The starting points were generally traceable to vineyards where nursery stocks had been propagated, but our investigations had all been commenced too late to determine whether the disease had been imported from Europe, or from States east of the Rocky Mountains. After considering all the facts bearing on this question, it is fair to presume that the pest was introduced upon the roots of stocks brought from American nurseries, where the disease is now known to have existed. The same danger still threatens other sections through careless purchases of viticultural novelties of American growth, and possibly through the transmis-

sion of vines propagated by the Agricultural Department at Washington.

A careful review of many vineyards, which have been planted with cuttings taken from vineyards now known to have been diseased, tends to prove that only rooted vines are much to be feared. This is certainly true of vines grown in this State; how far it may be true of cuttings from eastern vineyards is not well established. We have learned enough, however, to feel it necessary to caution planters against all rooted vines propagated in infected districts (all Eastern States being considered for this purpose as infected), and to insist on the importance of disinfecting all cuttings, irrespective of origin, as a measure of wise forethought.

The infected vines in loose, friable, deep, and moist soils were found to resist the ravages generally a long time, and skillful fertilizing appears to be successful in reviving many that have been rapidly declining. How long the disease may be held in check by stimulating vegetation is not yet well understood; but this remedy is certainly not a safe one to rely upon for permanent success.

The prevailing Summer winds in the valleys of the counties near the Bay of San Francisco are in directions from the west, easterly, and southeasterly. Topographical modifications deflect these currents sometimes northeasterly.

We find that in the Sonoma Valley the progress has been very slow towards the west and north, but very rapid towards the east. The Napa Valley, south of Yountville, has apparently been invaded by the winged female, which has been blown across the high mountain ridge which divides this region from Sonoma. North of Yountville the pest was only found in a few spots, notwithstanding that part of the Napa Valley has the greater number of vineyards.

In Santa Clara County it evidently started in one of the original nurseries in the Town of San José, thence it was blown easterly and infected two other spots. This is more likely to be true than that it was carried on cuttings or roots from the nursery mentioned; because, while many vineyards westerly and southerly were planted partly with stocks from this breeding ground, no evidence of the disease has yet been discovered in them.

The infected places in the Sacramento, San Joaquin, and Sierra foothill counties are not so easily explained, but it is probable that they were diseased by occasional use of rooted American stocks, or by using rooted vines grown in their neighborhood. The Orleans Hills vineyard, in Yolo County, was planted with stocks from Europe, but the cuttings were first propagated in Sacramento County, where the disease was probably fastened upon them.

During the Summer of 1883, and recently this year, further examinations have been made which confirmed the deductions made from previous observations.

Careful experiments have been made with the known efficient remedies, as recommended in France. The value of the bisulphide of carbon and the sulpho-carbonate of potassium has been demonstrated by us, and we can add nothing of information respecting these insecticidal remedies which was not fully set forth in my first annual report. We encountered, however, so much reluctance and neglect in pursuing this method of salvation for the sick vines, that we must be compelled to consider insecticides as impractical, except in isolated cases, or unless the State should authorize and enforce a

rigid quarantine and compulsory disinfection. The latter chance is scarcely a possibility.

Experiments with new remedies, as proposed from time to time, are being continued; but details are worthless until positive success appears probable. In respect to efforts now being made to accomplish the desired result by Dr. Bauer, of this city, I am pleased to say that the prospect is encouraging.

The main reason for the lack of systematic effort in using insecticides is the confidence which is now felt in the practicability of restoring diseased vineyards by means of American resistant stocks. It has been well established by several vine-growers, as well as by the experiments conducted by this Commission, that certain American species and varieties of vines will flourish even in the worst infected spots, and the practicability of grafting such stocks has been satisfactorily shown.

While searching for the presence of disease, we at first caused much alarm, and in some instances aroused opposition to our work. I believe that these unavoidable difficulties no longer exist, but that the visits of our expert are now welcomed everywhere. We have, indeed, to deny making many examinations that are called for, our funds not being sufficient to do all the work that we find before us. We have, with sufficient accuracy, outlined the known limits of the infected districts, and keep in our office for future reference the notes of all vineyards infected. Those who are not familiar with the appearance of the pest can obtain ample instructions through our reports, or by consulting neighbors, who are well informed; also, by visiting this office and examining specimens in our microscopical rooms, and by attending our regular annual State conventions. We have advised vine-growers to form local viticultural societies, where none now exist, and to coöperate in employing experts to make careful examinations each year. The month of August is the best time to begin such work.

Concerning the varieties of resistant stocks now known, further information will be found under the topic of ampelography.

We have learned sufficient already to be able to make public certain conclusions, viz.:

First—That the ravages of phylloxera do not threaten rapid destruction of vineyards in this State.

Second—That by using wise precaution in disinfecting cuttings before planting, and avoiding the use of rooted vines from infected districts, new plantations may be made with little danger of infection, except in the direction of prevailing Summer winds that blow from diseased places.

Third—That whenever infection is discovered in a vineyard, prompt action in substituting resistant stocks for those diseased, will not only check the evil, but will result in such a gradual reconstitution of the vines, that the extra expenses and losses will not be severely felt by the proprietors.

Fourth—That in all cases of new plantations in the directions of known contagion, only resistant stocks should be planted.

Fifth—That fear of future trouble from this pest may be avoided in any case by planting resistant stocks, even though present infection is not feared.

Sixth—That grafting upon resistant stocks may be easily accomplished without extraordinary expenses, and that the cost is more

than compensated by the increased vigor and fruitfulness of the vineyards so treated.

Seventh—That, in substituting resistant stocks for those diseased, efforts should be made to eradicate as carefully as possible the insects already accumulated on the roots that cannot be removed, or that are grafted. This is important as a means of removing danger from the vicinity of vines not infected, or of reducing the force of the invasions, and as a protection to the young roots of the resistant stocks, which, while they resist, may be in a measure checked in growth by the efforts of the insects to maintain their position. The bisulphide of carbon, and the sulpho-carbonate of potassium, are the best known agents for disinfecting the diseased spots.

Eighth—That, although submersion of infected spots may preserve a vineyard wherever practicable, if practiced annually after the disease is known to exist in it, yet the simplest and cheapest remedy, even where land is level and water plenty, will be found in using resistant vines as substitutes, this being a permanent defense.

Ninth—That all vine-growers should commence by experimenting at once with the best known resistant stocks in limited numbers, so as to determine in case of need which varieties will flourish best in their soils, and to afford themselves and their workmen the opportunity to learn by practice the simple art of grafting.

HOW TO DESTROY DISEASED ROOTS.—We have conducted several experiments to determine by what practical means the roots of diseased vines may be suddenly destroyed in the soil. Last Fall, before vegetation was quite completed, we were afforded an opportunity to experiment at St. Helena. Many different substances, such as sulphuric and nitric acid, arsenic, prussic acid, sulphate of copper, bisulphide of carbon, etc., were injected into the trunks, by means of holes bored into their centers and afterwards plugged, but no satisfactory results were achieved. We desired not only to determine whether the roots to their extremities might be suddenly killed, thereby causing the starvation of the insects feeding upon them, but also whether by inoculating the sap with any substance we might poison the pests without killing the vine. The latter result was not seriously expected, but, as in many other efforts, we desired to satisfy our minds thoroughly on the subject. Among the substances tried for this purpose was quicksilver.

The experiments proved nothing very satisfactorily. The season was badly chosen, the sap at that time not flowing freely. Traces of certain substances could be followed through certain branches upwards, but in no case did they work far down into the root system. The tissues of the vine appeared to absorb the materials used from the sap in its upward motion.

Mr. J. H. Wheeler, our Secretary, went to St. Helena to superintend this work, and will give in his report interesting details of his observations.

We have recently commenced these experiments again (in the month of August) with more system, and may be able to report some results before this volume is issued from the press. At this time the work is being conducted at St. Helena by Mr. F. W. Morse, of the State University, under our instructions. Vines will be tested both without and after cutting away the trunks. This subject is specially mentioned as a suggestion to others to make similar experiments.

We have found roots living and sustaining the phylloxera two years after the trunks have been cut away. It would be a great advantage if we could effect a sudden and complete destruction of the entire root system, in all cases, where diseased spots are to be replanted even with resistant stocks.

FUNGOID DISEASES.—We have made little progress in determining the true character of fungoid diseases which attack our vines. The practice of using sulphur is becoming general throughout the State, but there are some fungoid attacks which resist the application. Our efforts to have these peculiar diseases properly classified have not yet been successful; but we are in hopes to be able to report more satisfactorily next year. The services of a distinguished scientific specialist in this department have been promised to us; meanwhile our Secretary is collecting specimens of the fungi as rapidly as their presence is reported.

Instructions as to the use of sulphur for the *oidium* may be found in the proper place in this report.

OTHER INVESTIGATIONS.—Many other investigations relating to insects, culture, fertilizing, fermentation, preservation of fruit and grape juice, etc., have been continuously made, and some are now in hand. Our Secretary is at this time conducting interesting experiments in fermentation in the laboratory connected with these offices. These subjects are, however, treated upon in full under proper heads, and incorporated with information derived from all sources.

VITICULTURAL CONVENTIONS HELD UNDER THE AUSPICES OF THIS COMMISSION.

One of the most important works of this Commission has been the successful inauguration of viticultural conventions. Experienced men in all branches of our industry, as well as those recently engaging in it, have been brought together for purposes of serious consultation, discussion, and study. A spirit of sincere criticism and frank inquiry has been awakened, and many earnest public spirited workers of talent and experience have been enlisted in the common cause of advancing the true interests of viticulture. The power of the authorized officers of the State has been in this way multiplied many times for the public good, and the rapid development and propagation of sound opinions have been insured.

THE FIRST ANNUAL STATE VITICULTURAL CONVENTION.—In accordance with instructions of the Commission, I prepared a series of rules and regulations and framed the call for the first annual State Viticultural Convention, held in Dashaway Hall, September 18, 19, and 20, 1882. Realizing the great number of topics that might be raised for discussion, it was considered best to adopt a programme, and to give most prominence to those questions which related to the proper establishment of the vineyard, and to reserve the control of the sessions so that they might not be diverted into channels foreign to the purposes of the invitations. The work was successful in inaugurating a series of similar meetings, in awakening a frank and sincere spirit of inquiry, and in banishing all disposition to subor-

dinate the true interests of viticulture to local prejudice or the false pride of inexperience.

A broad foundation, taking in the scope of viticulture and the markets for its products throughout the world, was laid in discussing the qualities of goods that find favor in commerce, the soils and climates of the countries producing them, the varieties of vines found adapted and necessary for specific results, and the comparisons in soil, climate, vines, and existing products that might then be instituted between viticultural sections of California and those of other countries.

The tendency of the people of this State towards viticulture had at that time become so positive that we deemed it of the utmost importance to clearly define certain leading principles that should govern the minds of those who should undertake to plant new vineyards, and which should guide those who had already done so in improving their plantations with reference to the merchantable quality and types of their products.

We endeavored to cause the planter, who had selected his land, to realize that he must determine first in his own mind what types of products, as known to the commerce of the world, he might reasonably hope to reproduce, or approximate; next, which of those types he would select as his aim; and then what varieties of vines would be best suited in his place to produce the result desired.

To illustrate the varieties of vines then growing in California, exhibits of fruit were solicited and obtained from many vineyards, and to show their special uses samples of wines, spirits, raisins, etc., accompanied them. Aided by these exhibits the work of classifying varieties according to true nomenclature was materially advanced. The merchants, as well as producers, derived much benefit in ascertaining by means of the samples of experimental fermentations and distillations the immediate possibilities of improvements in vintages through propagation of approved vines. Suggestions for experiments in improved methods of culture, fermentation, blending, distilling, etc., were made, and by this concurrence of experienced growers and merchants those intending to engage in viticulture received a strong and practical impulse into right directions, thereby avoiding many errors of thoughtless planting.

It became so evident that great improvement would be demanded in the quality of products by the markets within our reach, especially when our annual crops have been greatly enlarged, that nearly all the older vine-growers commenced from that time seriously to make such experiments with and studies of varieties of vines as would lead them rapidly to improve their vintages. Since then the advance in such practical knowledge has been remarkable. The result will be demonstrated in the agreeable surprise of the consumer of our products in the next few years.

Condensed portions and extracts of the reports of this and other conventions will be published in a separate volume. We have pursued the practice of preserving full stenographic reports of the proceedings, granting to the press the full use of the same.

THE LOS ANGELES VITICULTURAL DISTRICT CONVENTION.—The organic law of this Commission contemplates an annual viticultural convention in each of the seven districts of the State, to be called by the District Commissioner. Several have been held, but the practice

has been irregular. The greater importance of a regular annual convention for the entire State, in which all districts participate, has in a measure absorbed the interest and energy of the people. While there may be more such meetings in future, we have found that it is more satisfactory to concentrate attention each year to district conventions, where all will unite in the study of work in the field, and one State Convention in San Francisco, where the best opportunities are presented for making exhibits and for serious discussion and instruction.

The First District Convention, in which all other districts were invited to participate, was held in Turn-Verein Hall, Los Angeles, June 21, 22, and 23, 1883, at the call of Mr. L. J. Rose, Commissioner for the Los Angeles Viticultural District. By a resolution of the full Board, all the members were requested to attend, and to impart such instruction as their experience enabled them to offer, while at the same time gaining information for use in their own special work, as required by law.

The following named members responded to the invitation and took part in the proceedings: Arpad Haraszthy, President and Commissioner for the San Francisco District; I. DeTurk, for the Sonoma District, Chas. Krug, for the Napa District, Geo. West, for the San Joaquin District, and J. DeBarth Shorb and Chas. A. Wetmore for the State at large. L. J. Rose, for the Los Angeles District, presided, and J. H. Wheeler, Secretary for the Commission, acted as Secretary.

The topics were similar to those of the preceding State Convention, with much local application of subject-matter. An interesting local question was frankly and freely discussed in relation to the variety of vine known popularly as the *Mission* grape. The experience of the older vine-growers of the State with this vine was made known so effectively that its further propagation has been materially diminished, and experiments in grafting upon those already planted more valuable varieties, have been in many places begun. Great advantage to viticulture in Southern California will soon result as a consequence of this reform.

THE SECOND ANNUAL STATE VITICULTURAL CONVENTION.—The growing interest in public discussions and studies was plainly manifested by the largely increased attendance during the second annual State Viticultural Convention, which was held in Dashaway Hall, San Francisco, August 27, 28, 29, 30, and 31, 1883. The exhibits of grapes and instructive samples of viticultural products, literature of the industry, useful implements, resistant vines, grafts, specimens of the vine pests, etc., were much larger and more comprehensive than before. During five days the morning sessions were devoted to systematic examinations and study of exhibits and their comparison with typical products of other countries—France, Germany, Spain, Portugal, Italy, and Hungary; the afternoon sessions to public discussions of questions relating to culture, raisin curing, table and shipping grapes, fermentation and distillation, and especially to the improvement of vintages by means of properly selecting and propagating varieties of vines; the evening sessions to lectures setting forth scientific theory as well as practice and mercantile experience.

The samples of products from many different varieties of vines, illustrating careful experiments in many different districts, demon-

strated to all the possibility of rivaling in this State many of the most celebrated types of the world.

The successful inauguration of this method of popular study and education may be said to have produced even brilliant results. The actual accomplishment, defects, and possible attainments of our industry, as well as the true path of progress, were demonstrated so clearly that the impetus towards practical improvement was greatly felt during the season for planting and propagation that followed. Many new experiments by means of grafts on old vines and improved systems of pruning and methods of fermentation, distillation, and raisin curing were begun; many systematic plantations made from approved varieties now attainable; many new importations of desirable vines; many extended uses of resistant stocks.

The triumph of science and art in viticulture over unguided, un instructed, and uninspired effort had been signally achieved, and it may be said that from the date of these conventions the viticulturists of California are unitedly and harmoniously striving, with intelligence and determination, to achieve an industrial victory that will be an honor to their country as well as a security for the prosperity of their children.

THE SAN JOAQUIN DISTRICT VITICULTURAL CONVENTION.—At the call of Mr. George West, Commissioner for the San Joaquin District, a Convention was held in the Opera House, Fresno, June 10, 11, and 12, 1884. The full Board united, as in the case of the Los Angeles Convention the year before, in inviting all districts to participate. This action was responded to by the attendance of viticulturists and merchants from many parts of the State, and, on the part of the Commission, by the same members that took part at Los Angeles.

The raisin producers were especially prominent on this occasion, and to their special interests was devoted about one half of the time spent in examining vineyards and in discussion of topics. The other specially important subjects of study were varieties of vines of local value, fermentation (especially the control of temperature in the fermenting rooms), construction of cellars, irrigation and drainage, and the destruction of insect pests.

Mr. Willard B. Rising, Professor of Chemistry of the University of California, on this occasion began the work, in which he is now engaged together with Professor E. W. Hilgard, of the Agricultural Department of the same institution, of making a careful study, in behalf of this Commission, of practical fermentation and the difficulties encountered by our wine makers. Their report will be presented to us in time for use at our next State Convention.

The practical results of the work at Fresno were mainly in ascertaining the wants of the raisin producers, and in providing for their proper presentation before Congress; in determining certain important principles relating to the cultivation and curing of Muscats; in making known local experiences, with approval and disapproval of certain varieties of wine grapes; in suggesting new varieties for improvement of stocks; in comparing wines fermented by different methods, especially dry red *Zinfandel*; in suggesting practical methods for controlling temperature in hot climates; and in calling attention to the importance of thorough drainage and protection of vineyards from an excess of water.

Mr. Matthew Cooke gave valuable assistance in directing efforts towards the destruction of insect pests.

THE THIRD ANNUAL STATE VITICULTURAL CONVENTION.—The Board has decided to call the next State Convention to meet in San Francisco in December of this year. It is desired that the wine producers will now unite in giving special prominence to studies of fermentation and the care of new wines. It is hoped that the record of experience, both as to unfortunate as well as to fortunate results, will be illustrated by samples and explained as carefully as is practicable by those who truly realize that much progress has yet to be made in this direction. Rules for the guidance of the inexperienced, both of local and general application, will be sought.

Distillers are expected to show and compare improved samples and to explain the methods of production. Raisin makers will compare products and give and receive practical suggestions. Merchants will indicate commercial preferences and impart valuable hints as to the profitable lines of effort. The raisin makers at that time also intend to perfect their plans for presenting their claims for protection before Congress. The reports of our special scientific investigation, now being conducted by Professors Hilgard and Rising, will add interest to the sessions.

The time designated was selected, because then the greater number will be at leisure to attend, and will have fresh products of the vintage of 1884 to exhibit and compare.

EXHIBITS AT CONVENTIONS.—This Commission has not deemed it important to invite exhibits for purposes of competition. Instruction, derived from unprejudiced study of products, is the object aimed at. Defective samples, when shown as such, are often as valuable in exhibitions as perfect products, provided sufficient information accompanies them to render them worthy of investigation. All unprejudiced and progressive producers will gain some advantage by taking an opportunity to impartially compare their work with that of their competitors, not only domestic, but also foreign.

VITICULTURAL INSPECTIONS AND CONSULTATIONS WITH VINE-GROWERS AND LOCAL SOCIETIES.

Many who have a practical interest in our industry consult personally with the members of this Commission. The personal interviews and correspondence of my office have multiplied to so great an extent that I find much difficulty in performing my duties in all respects as I know the people of the State have the right to demand. When I am not traveling, I find it necessary to devote my evenings and holidays, including the legal day of rest, to study and writing. I find that, as this great work grows in popularity with the people, I am neither accomplishing my public nor my private duties with satisfaction to myself. Our Secretary has assumed much of the labor attending upon correspondence that comes to us, especially concerning insect and fungoid pests, and is personally conducting laboratory investigations. Mr. F. Pohndorff has also relieved me from the labor of a part of the foreign communications which pertain to information required in preparing these reports. I am, however, forced to neglect many opportunities for acquiring and disseminating informa-

tion, which I have continually in mind, and which cause me to be conscious that the State should have the benefit of one free from all private cares and business. I am convinced that the law which prevents this Commission from giving sufficient compensation to secure the undivided labor of a competent executive officer, should be amended. While I hold my office I intend, as I have done, to discharge its duties to the full extent of my strength and opportunities, but I have been made, by illness this year, to know that human resolution is not clothed with cast-iron flesh. The time is coming very rapidly upon us when the viticultural producers of California will need more aid and counsel than this Commission, as now restricted, can grant. A great industry, in the hands of experienced people, should have the strong arm of perfect organization supported by law to lean upon; the result being a well equipped system of industrial education and popular scientific research. If I do not keep pace with my own conception of the work at hand, it is because private necessities compel me to devote a share of my time to private business. If the Commission desire me to continue in this office, the interests of the people also demand that it should be amply provided for. Let the agriculturists, who have a right to complain, compare the salaries of agricultural officers with those of Bank, Railroad, and Harbor Commissioners, and such judicial and executive officers whose duties require the labors of competent educated men. If, after such comparison, they are satisfied that their representatives are liberally provided for, then they need no remedy for neglect.

Besides personal interviews and correspondence, our direct communication with vine-growers and all interested with them is largely increased by means of local viticultural societies. These have been formed in a number of districts and are very useful. Every well established vine-growing community should perfect such organizations for mutual advantage. As a means of rapid dissemination of local viticultural knowledge, they are almost indispensable. They are also of great assistance to this Commission in obtaining results of local experience.

I have, since my last report, responded to invitations to address and consult with local societies and public meetings of vine-growers, in addition to the district and State conventions in different parts of the State. If there were in all such places as Anaheim, Los Angeles, San Gabriel, Sacramento, Woodland, Placerville, Rocklin, Stockton, societies similar to those of St. Helena, Napa, Sonoma, Santa Clara, and perhaps a few other places, our opportunities to meet and work with vine-growers would be greatly increased. I have been able to visit a very great many vineyards, but the objects of such visits are generally in relation to some certain investigations, which are best accomplished among the older bearing vines. It would be impossible in any case to visit all; yet often it is the planters of new vineyards who are most to be benefited by the lessons learned. The meetings of local societies afford opportunities for the interchange of opinions and advice and enable the public press to multiply the avenues for information. I cannot too forcibly urge the importance of the immediate organization of such bodies and of a more general attendance upon all district and State viticultural conventions. The grape crop of the State will be more than threefold increased in the next three years, and will tax the talent, energies,

and resources of all who are interested in it to the utmost to prevent even temporary commercial derangements.

Such a rapid increase in production will demand a corresponding increase in all the manufacturing, storage, and mercantile facilities. By proper organization the merchants may be aided in carrying the products and opening new markets. In like manner, our State and National legislators may be made better acquainted with our necessities. The producers should not forget also that there are organized enemies of their industry, whose motives may be honest and sincere, but whose ignorance of the social and moral character of the great respectable body of vine-growers is sadly in need of enlightenment. Heretofore the great labor of defending the industry against the foul blows of its adversaries has been left almost entirely to a handful of enterprising merchants. That our industry is one of the most important elements in the social, moral, and intellectual development of the State and Nation, that it is conducive to public happiness and prosperity, and that it numbers in its ranks a large and growing population of patriotic citizens, should be made so apparent that factional social and political opposition must cease, and be changed into cordial coöperation. It should be made manifest that this industry will aid in securing proper and just control of all popular abuses, as far as wisdom should prevail, and the infliction of proper punishment to all offenders against the public peace. Those who have crude and ignorantly-formed notions of the influence of our industry on public morals, should be taught that our interest can only be best subserved by the development of habits of industry, true temperance, and social progress, and that while we stand by ready, if necessary, with our lives, to protect the people in the right to a free religion, we claim the same coöperation on the part of all in protecting our rights to enjoy our daily meals free from the inquisition of the public detective. While certain ecclesiastical associations and intolerant societies, enjoying the freedom of thought that was fought for and won for them by our ancestors, who were, in a great measure, recruited from our industry and almost wholly from its friends, are preaching political crusades against the liberty of our firesides, our producers, whose property as well as liberty is threatened, if not with destruction at least with odium, should not forget that error may be conquered by the missionaries of popular education. If it is right that the State and Nation should foster ours, which is one of the most civilizing of all industries, it is not only right but incumbent on us to vindicate the wisdom of our legislators.

The first steps in the direction of mutual aid and progress will be also in the direction of our assertion of self-respect and determination to protect the liberty of our homes. The *personnel* of the local viticultural societies of the State will compare more than favorably with that of its organized enemies.

FOREIGN CORRESPONDENTS AND EXCHANGES.

Besides profiting by exchanges of reports, treatises, and periodicals, which we now receive from foreign as well as American horticultural and viticultural societies and public institutions, we are indebted also to many private persons for frequent communications and documents. These sources of information could be greatly

increased if I had more time for correspondence. Among those to whom we are under special obligations, are Professor G. Foex, Director of the National School of Agriculture, Montpellier, France; Professor M. A. Millardet, of the Faculty of Sciences of Bordeaux; Monsieur Ch. Joly, Vice-President of the Central Horticultural Society of France; Monsieur Stanislas Baron, of Paris; Monsieur Leopold Gros, Soubes (par Lodève), Hérault; Madame la Duchesse de Fitz-James; Wm. Forrester, Esq., Oporto; Mess. Blandy & Co., Madeira; Prof. Blankenhorn, of Carlsruhe; M. Rebora (of Italy), at Bordeaux; M. Lichtenstein, of Montpellier; Dr. L. Lunier, Secretary of the Temperance Society of France; and Dr. Druitt, of London.

Mr. F. Pohndorff, coöperating with us by correspondence and the study of foreign publications, desires to acknowledge direct and indirect information from the following sources:

Professor Dr. P. Hahn, Cape Town, S. Africa.

Mr. F. Schade, of the "Winberg Times," Cape Division, S. Africa.

Professor Dr. I. Bersch, Vienna, Austria, author of several books on wine and grape-growing, and editor of the "Wein Zeitung," of Vienna.

Mr. Edmund Mach, Director of the Provincial Agrarian Institute of San Michele, Southern Tyrol, author of several oenological works and among them the newest of 1884, "Fermentation and Technology of Wine."

Professor Ottavio Ottavi, editor of the "Giornale Vinicolo Italiano," Director of the Experimental Cellar, Casale Monferrato, Italy.

Mr. Hermann Goethe, Director of the Styrian Provincial Pomological and Viticultural School, Marburg, T. D., author of ampelographical works.

Professor Dr. F. X. Landerer, Royal College of Agriculture, Athens, Greece.

Don José de Hidalgo Tablada, Madrid, Spain, author of books on viticulture and olive culture; editor of the technical paper, "Los Vinos y los Acetes."

Professor Dr. C. Reitlechner, Lecturer on Chemistry at the Imperial Oenological and Pomological Institute at Klosterneuburg; author of several works, the most recent (1883) the "Component Parts of Wine."

Mr. Anton Hauch, Director of the Royal Hungarian Board of Chemical Analysis; author of "Viticulture and Wine-making."

Mr. A. Basarow, Director of the Imperial Establishment of Acclimatization and Viticulture at Nikita, Crimea.

Mr. H. Scharrer, Tiflis, Transcaucasia.

Mr. Gustav Clauss, Anglo-German Wine Company, "Achaja," Patras, Greece.

Mr. E. A. Toole, Cephalonia, Greece.

Don José Lopez de Carvajal, Puerto de Santa Maria, Spain.

Commendatore Giovanni Boschiero, President of the Chamber of Commerce of the Province of Alessandria, Asti, Italy.

Comm. G. Caruso, Professor of Agriculture at the Royal University of Pisa, Italy; author of several books on viticulture and olive culture.

Monsieur Eugène Chesnel, of the "Moniteur Vinicole," Paris, France.

Monsieur E. Terrel des Chênes aux Chênes, Villié Morgon, Rhone, France.

Professor Dr. Nessler, Karlsruhe, Germany, author of books on wine.

Dr. Hermann Müller Thurgau Docent, Royal Institute for Pomology and Viticulture, Geisenheim, Germany.

Mr. Rudolf Goethe, Director same Institute, Geisenheim, Germany.

From material which we have furnished, directly or indirectly, to Monsieur Ch. Joly, he has published, in Paris, several illustrated pamphlets, copies of which have been sent to us, on the "Big Trees" of California, also on our methods and machinery for canning, drying, and preserving fruits, and on the Yellowstone Park. He is now about to issue another, illustrating and describing the celebrated mammoth grapevine of Montecito, Santa Barbara County, California, as a companion to his descriptions of the vine at Hampton Court, and others of similar distinction.

We find translations of and many instructive comments upon the reports of our viticultural conventions, and intelligent reviews of our work, in numerous viticultural periodicals of France and Germany.

Several of the foreign consuls, residing in this city, have availed themselves of full statements of the condition of viticulture on this coast for transmission with their reports to their respective Governments. Those who have more especially sought from us statements in addition to our ordinary publications have been Monsieur A. Vauvert de Méan, Consul for France, and Mr. James De Fremery, Consul for the Netherlands.

The State Department at Washington has procured for us through the consular service several important communications, which we specially requested.

LEGISLATION DEMANDED BY THE COMMISSION.

In accordance with the wishes of the Commission, I prepared and presented to the last session of the State Legislature a bill, supplementary to the Act granting to us certain quarantine powers for the protection of vineyards against insect pests. This was intended to cure a defect found by the Supreme Court in the present law. The bill was delayed and did not receive final action for want of time.

I presented, also, at the same time, a joint resolution, urging Congress to pass certain legislation, as demanded by the Commission. It was passed by the Assembly, but failed to reach final action for want of time in the Senate.

In a recent communication to Mr. J. B. J. Portal, President of the Santa Clara Viticultural Society, I have stated the present demands of the vine-growers, being in substance a repetition of previous action of this Commission, as modified in accordance with resolutions of the raisin producers at Fresno, and with certain additions recently approved on behalf of wine makers and distillers.

The following is the communication in full :

SAN JOSÉ, July 28, 1884.

J. B. J. Portal, Esq., President Santa Clara Viticultural Society :

DEAR SIR: We cannot afford that our wants in the matter of legislation should be misunderstood at this time, and for this reason I beg you to request the local press to publish the following as a brief summary of the demands made by our viticultural industry, and which is respectfully dedicated to the candidates for Congress and Legislature of all parties, as well as to those now holding office :

The tariff on raisins has been reduced to two cents per pound. This industry cannot succeed unless a higher rate is fixed, and it demands such protection that it may compete successfully,

and on fair terms, as to cost of production and transportation, with foreign goods, in the markets of the Atlantic States.

A tariff that would be satisfactory for the market of San Francisco would not protect the industry in New York, because the cost of transportation is nearly four times greater for the California product than for the Spanish. At a convention of raisin producers held in Fresno, in June, a rate of five cents on Muscatel raisins, and three cents on Sultanas and currants, was demanded.

The wine producers demand a continuation of the present policy of protection, not only for their own industry, but for all others that are conducive to the general prosperity. They desire that their customers, who are interested in other industries, shall be prosperous, in order that the home American markets may be kept good for their trade. They claim that the advantages of a protective policy in preserving to us our home markets shall be reciprocally enjoyed by all industries that may be successfully established.

The wine producers demand of all candidates for legislative offices, State or national, and of all parties, a full, frank, and sincere acknowledgment of the importance of their industry to the State and Nation, and assurances that it shall be openly fostered as being conducive to the public welfare, and that its enemies, whether under the guise of intolerance or political abstraction, shall be repudiated.

The wine producers demand new legislation to remedy defects in present laws, viz.:

First—That the duty on fermented drinks be rated according to alcoholic strength, so that spirit used in Europe to fortify sweet wines shall not be untaxed, while our producers may have to pay ninety cents per gallon on spirits for similar purposes.

Second—That pure grape spirits may be used by our wine makers, in fortifying sweet wines to preserve them, without tax, this privilege not to be extended to the use of other spirits. Wines so fortified not to exceed twenty-two per cent of alcohol.

Third—That the internal revenue tax on spirits should be based on taxation on consumption, not on production; that if any limit be placed on the time for which brandy may be kept in bond, it be so extended as to give producers ample time after their goods are fully matured to seek purchasers; and that it is the duty of the Government to protect customers against unwholesome new spirits by granting a rebate of at least ten per cent on the tax for each year, not exceeding five, that brandy is kept in bond.

That further facilities be granted in bond for refilling packages under distillers' stamps.

That the existing law providing for the taxation of spurious and adulterated wines shall be enforced, or, if found defective, shall be amended so as to prove an effective protection of consumers against imposition, and of producers against ruinous competition. The wine producers claim that Congress legislates to foster their industries but does not intend to foster fraud and adulteration. The Internal Revenue Department should be preserved not only as a source of income to the Government, but also as a means of discovering and exposing fraud and adulteration. For the information of those who may be misled by typographical errors that have appeared, it should be stated that the present tariff on still wine in casks is fifty cents per gallon (still wine not exceeding twenty-four per cent of alcohol) and two dollars on proof spirits (about fifty per cent alcohol). Natural imported wine may contain from nine to fourteen per cent of alcohol. Distilled spirits in imported wine should be taxed.

The wine growers do not desire to enter politics except so far as their interests compel them to do so. They desire to be on friendly terms with all parties, and claim that their industry should not be a bone of contention in a State where all are interested in its advancement.

Yours respectfully,

CHAS. A. WETMORE,
Chief Executive Viticultural Officer.

The following is the report of the Raisin Committee made to the Commission at the San Joaquin District Viticultural Convention:

To the honorable the President and Board of Viticultural Commissioners for the State of California, assembled in convention at Fresno, June 12, 1884:

GENTLEMEN: Your committee appointed to investigate the present tariff on imported raisins, and its effect upon the raisin industry of the State of California, beg leave to submit the following, to wit:

WHEREAS, The manufacture of raisins is a growing industry in this State, furnishing honorable employment to thousands of families; and whereas, intelligent and well fed and well clothed laborers (and this is as it should be) are the only laborers at our command, and, hence, it being rendered impossible under the present low tariff for us to compete with the raisin-producing countries of Europe, where labor costs about one fifth as much as in this country; and whereas, we do not desire, had we the power, to detract in any manner from the dignity of labor in America, or to reduce the laboring classes to the wretched condition of the laborers of Italy and Spain; and whereas, your committee find upon careful investigation, that the present tariff is wholly inadequate for the protection or encouragement of this industry, and as a consequence, unless we get speedy relief, our raisin manufacturers will, inevitably, be driven from the business, or be so crippled in their efforts as to deter others from engaging in this pursuit; and whereas, the prime cause of this deplorable state of things is the want of reasonable and

proper protection; and whereas, the manufacture of raisins in California, if fostered and protected by our Government, is destined to become one of the most agreeable and lucrative industries of the State of California; therefore, be it

Resolved, First—That it is the sense of this Convention that a duty of at least five (5) cents per pound should be levied on all imported raisins and dried grapes, excepting the Seedless Sultana and Corinths, on which latter there should be levied a duty of three cents per pound.

Second—That the Chairman of this Convention appoint a committee of three with instructions to draft a memorial to the United States Congress, setting forth fully the requirements of the raisin industry of this State.

Third—That the Chairman of this Convention, and committee aforesaid, see to it that said memorial or petition be forthwith placed in the hands of energetic and responsible persons, whose duty it shall be to secure every signature possible, and to keep said memorial in circulation until the assembling of our next Congress.

Fourth—That the State Viticultural Commission hold a special meeting at the City of San Francisco early in the month of December next, and then and there make arrangements whereby said memorial shall be presented by efficient persons at the opening of the next session of Congress.

J. O. B. STILLMAN,
Lugonia, San Bernardino County.
ROBERT McPHERSON,
Orange, Los Angeles County.
T. C. WHITE,
Fresno, Fresno County.

The foregoing report was unanimously adopted by the vote of the vine-growers present at the Convention.

THE TREATY WITH MEXICO.

During the Spring, while the last session of Congress was in session, I was confined to my home so much by illness that I failed to observe closely the pending legislation relating to the recent commercial treaty with Mexico. When I was informed of its provisions concerning the free entry into the United States of fruit products, I was surprised that others had not entered their protest against the passage of a law to put it in full operation. At a meeting of vine-growers in Riverside I called attention to the danger threatening both the citrus and viticultural industries, but was informed that it was now too late to take any action to defeat the measure, so far as our interests were concerned. Since then I have learned that the bill to carry the treaty into effect is still pending. There is, therefore, necessity of prompt action in the matter.

It is my belief that the first duty of the Government is to sustain and protect the industries of this country, and that we should enter into no treaties with foreign countries which shall in any way endanger the harmonious operation of our laws by destroying the reciprocal advantages of a protective tariff. That we should cordially give our support to national measures intended to enlarge our opportunities to dispose of surplus products I am fully convinced, but I hold that the producing classes of this country should never permit the interests of domestic commerce to be subordinated in any respect to the temporary interests of those who are speculating in real estate and transportation companies in foreign lands. It would certainly be suicidal to our public policy to sacrifice home industry in the interest of a comparatively small surplusage of certain productions. The holders of surplus goods have their remedy under their own control, and need no legislation that requires any sacrifice of public policy.

It is well understood to be the aim of the chief promoters of the commercial treaty with Mexico to advance the interests of railroad

companies and land speculators, whose possessions are within Mexican territory, by stimulating the colonization and cultivation of large tracts of land, which are not subject to our national control. If this can be done so as to promote healthful commerce without sacrificing our domestic interests, there can be no objection to the effort.

With respect to the fruit industries of this country, one may fairly claim, that present development in Mexico does not warrant that country in demanding any outlet into our markets; and that while our citizens have with great energy and intelligence inaugurated and fully established this industry within our own limits, it would be national folly to offer special inducements to foster a rival in a foreign land, where none now practically exists.

The few speculators in Mexican land grants contend that they can offer superior inducements to capital to engage in fruit culture, especially in oranges, lemons, limes, grapes, and raisins. The Mexican Government appears to be disposed to encourage the importation of cheap Chinese labor, a privilege that has been denied to the fruit grower of California, and which his patriotism forbids him to resent. With servile labor, cheap land, organized capital, and railroad influences, the industry of fruit culture in Northern Mexico might easily institute a ruinous rivalry with this State. The advantage of distance in transportation would be in many instances in favor of Mexican products. Those who would profit by it would not be the defenders of the American flag, nor supporters of our public treasury.

We have a right to demand that our Government, which protects our people against ruinous competition with servile and degraded labor at home, shall not sacrifice us to competition with the same labor in our foreign commerce.

It is in the power of Congress to withhold action on pending legislation until the treaty be so modified as to protect the interests of California and other States and Territories. It is of more importance to the Nation to extend fruit culture, if extended at all, into Arizona than into Mexico.

VITICULTURE IN ARIZONA.

During recent years many successful attempts to introduce viticulture into Arizona have been made. I am now in correspondence with people in that Territory, endeavoring to ascertain to what extent and in what particulars this competition may affect the prospects of California. I believe that in respect to table and shipping grapes and raisins, the possible production of Arizona, where there exist certain advantages of transportation to eastern markets, should be considered carefully by our people, when extending their plantations. I am in hopes soon to be able to make a tour of inspection in order that there need be no mistakes in our estimates.

While the northern States of Mexico are making efforts to introduce viticulture by free distribution of vast numbers of vine cuttings purchased in this State, we should applaud their sagacity, though we may not at the same time welcome their competition within our own markets. As to Arizona, however, we may be proud of a growing territory, and hail viticulture as a means of securing a civilized State as a future neighbor, subject to the same laws and responsibilities as our own.

I see many reasons to believe that viticulture will also become popular in certain portions of Oregon.

VITICULTURE IN OTHER STATES.

We have reason to welcome the efforts of viticulturists in States east of the Rocky Mountains to establish their industry. In many cases they have made notable progress. The vine-grower of the East, whose ambition is to substitute pure wine of native production for spurious compounds, now foolishly permitted and indirectly encouraged by the Government, will not only assist in enlarging the field of American industry, but will be a powerful ally to his brethren in California. We should appeal to him to unite with us in perfecting legislation to check the abuses of adulteration and imposition, and to demonstrate that, while the Government wisely fosters viticulture, it does not intend to overlook fraud and deception.

SPURIOUS AND ADULTERATED WINES.

There is a law which provides for the taxation of spurious and adulterated wines. It has been nullified by a construction of the Internal Revenue Department. Our Commission has authorized its President to take steps towards obtaining a new ruling. If the law proves ineffective, it is the duty of Congress to make it operative in such a manner that consumers may be protected from imposition, and producers against ruinous competition.

To illustrate the magnitude of this evil, I will quote a portion of a letter which I have recently received from a wine dealer of New York. He writes under date of August 7, 1884:

* * * As I have tasted here some very good Burgundy wine made in California from the Pineau grape, I don't doubt for a moment that your State will produce in a few years as good wine as is produced in France. The greatest enemy you will have to contend with is the spurious wines. As long as they are permitted to be manufactured, the wines of the country will linger under a cloud; as much of the wine sent here from California is "doctored," and, consequently, its quality is spoiled.

I know two manufacturers of this kind of trash, one with the name of ———, on Second Avenue, and the other Messrs. ———, Broad Street, New York. They each manufacture over 15,000 gallons a month. The former sells it as it is made to the wine dealers throughout the city and country, and also mixes some himself; but the latter are all using it for mixing with California wines, and send it to every State in the Union. Is it to be wondered then that California wines do not gain reputation as rapidly as they should, and as their fair quality deserves?

I am pleased to see that you will try to influence members of Congress in respect to enforcing the law. All the grape growers of the country and the honest wine dealers should petition to have the manufacture of this vile stuff prohibited.

The essential features of these spurious wines are corn spirits, glucose, acids, and flavoring matters, all of which can be put together very cheaply. When mixed with pure wines, dishonest retailers use the compounds to enable them to undersell those who sell pure goods. The consumers are imposed upon, money is obtained under false pretenses, and our producers are prevented from enlarging their markets by reason of the unpopularity which commercial swindling causes. The stamp of the internal revenue should follow and identify these goods throughout the trade upon all forms in which they reach the actual consumer. Such a law would be more effectively enforced than one prohibiting spurious manufactures.

I see no good reason why municipal regulations should not also

provide for the detection and punishment of the crime of selling goods under false pretenses. The worst enemy of the producer is the dishonest retailer, who swindles consumers and thwarts the laudable ambition of honest industry.

SCIENTIFIC RESEARCHES CONDUCTED BY THE STATE UNIVERSITY.

The viticultural work, which has been ably directed at the State University by Professor Eugene W. Hilgard, is appreciated by our vine-growers. The frequent bulletins issued by the distinguished Professor have already produced practical results by assisting progressive men in determining true methods for improving the quality of their products. It is fortunate for the State that a gentleman so entirely competent and public spirited occupies the Chair of Agriculture at Berkeley. We know, however, that the demands upon his time and strength have increased to such a degree that the agriculturists of the country should urge the State to provide liberally and ungrudgingly, by means of ample appropriations, all the facilities that he requires in conducting his work. The State of California cannot afford to suffer any unnecessary delays in procuring in aid of industry all the scientific enlightenment that is attainable. Professor Hilgard is a man of rare attainments and character; our people should make the most of the opportunities which his willingness to labor in their behalf offers. The State should with alacrity consent to adopt and support any comprehensive plan of action that his positively true genius and industrious disposition may project. The time for working out valuable results is comparatively short in the life of one man; yet, when we witness in our own time the wonders achieved for industry by such men as Pasteur, we cannot help condemning public parsimony as a crime against the people. This country is rich in resources and capable of accomplishing as much and more than any other in the world; yet, it does less in utilizing science for the benefit of the people than others that have less opportunity and less needs.

Our Commissioners instructed me to confer with Professor E. W. Hilgard and Professor Willard B. Rising, the latter being Professor of Chemistry at the State University, with a view of securing their services during vacations and the hours set apart for their rest, as a special commission to investigate questions of fermentation, and especially diseases and defects of wines that frequently trouble wine makers and merchants. It was asking much, but they have recognized the public necessity, and have undertaken the work with a zeal and promptitude that deserves the gratitude of the entire State, and an honorary distinction worthy of their sacrifices.

THE NEED OF STUDENTS TO QUALIFY THEMSELVES AS SPECIALISTS.

Many of the youth of the State who have graduated at the State University should apply themselves diligently to a special course of study, first at the State University, next in the producing districts of Europe, aiming to qualify themselves, both theoretically and practically, to take responsible positions in the future wineries, cellars, and mercantile houses of California. Such sure opportunities for honorable employment as specialists, seldom are offered to the students of any country.

They should first become masters of certain foreign languages, particularly of French and German, organic and inorganic chemistry, mathematics, mechanics, bookkeeping in its higher branches, the industrial geography of the world, domestic and foreign practical politics, and hygiene; and they should breathe in all their work the spirit of patriotism, hatred of fraud and deception, fidelity to private trusts, and honorable self-respect. Frankness should characterize their utterances, modesty temper their opinions, courage strengthen their action, and simplicity guard their success in life. The honest affection of home life should knit their hearts to their countrymen.

To some these observations may seem out of place in an official report, but we should realize that it is to such men in the future that we must look for the preservation of the fruits of our present labors. The need of thoroughly educated, practical, and honorable gentlemen, with uncompromisingly patriotic impulses, is already felt in our industry.

To give a practical point to these suggestions, let me advise prosperous citizens to endow scholarships at the State University for deserving graduates with these ends in view.

It is a pleasure to report that already a number of our young men, graduates of the State University, are now patiently pursuing the course that I have outlined here. Some are assisting the professors in their investigations, others are now in European scientific colleges perfecting their studies. Recently I have received from Mr. James De Fremery, who is visiting his native land, a letter requesting me to select samples of California wines for his son to analyze in connection with his studies in Europe. The example of such worthy citizens should emulate others to do likewise.

Many of the young women of the State, especially those who are destined to inherit agricultural properties, might find congenial studies in the same direction. Several ladies are already among our most successful viticulturists. In France the Duchess of Fitz-James controls personally an immense vineyard, and publishes for the benefit of the world the records of her many experiences. I predict for restless female minds more pleasurable activity in the direction of noble industries than in professions of law, medicine, or politics. The women of the country can reform the world more effectively in fields of education and industry than in political agitation of questionable methods of arbitrary moral control. Viticulture offers in California ample opportunity to employ all the talent that is now running to waste.

LOCAL RESIDENT VITICULTURAL INSPECTORS.

The law governing this Commission requires the appointment of Local Resident Viticultural Inspectors, whose duties are to cooperate and work in harmony with our purposes. The quarantine powers of the Board having been declared inoperative by the Supreme Court, the work of Inspectors, in respect to assisting in preventing the spread of vine diseases, is now limited to the dissemination of information concerning the danger or presence of disease, and the remedies to be applied to prevent its spread, effect its cure, or avoid its consequences. They are also very efficient in assisting us to distribute intelligently printed documents and occasional notices; also in collecting information for transmission to this office.

I have pursued the policy of attempting, by means of appointments of Inspectors, to organize throughout the State an efficient corps of studious, inquiring, public-spirited men, whose coöperation shall be of mutual advantage to all, and whose opportunities may be thereby increased for the acquirement and dissemination of viticultural knowledge. Whenever local recommendations have been made, I have made appointments accordingly; otherwise I have been obliged to rely upon personal acquaintance. There are many more yet to be added to the list as opportunity offers. Some districts are neglected in this respect, but only because I am not acquainted with suitable persons to appoint and receive no recommendations. Such omissions I hope to provide for as soon as practicable.

The following is the list of Local Resident Inspectors now appointed. It is desirable that any change of residence should be promptly made known to this office; also information should be forwarded by vine-growers whenever good reason for changes exist.

NAME.	Location.	Date of Appointment.
W. A. Sanders	Sanders, Fresno County	December 15, 1881
Henry Ellsworth	Niles	December 16, 1881
R. T. Pierce	Santa Clara	December 20, 1881
J. B. J. Portal	West Side, San José	December 20, 1881
H. Lefranc	New Almaden Vineyard; P. O., San José	December 20, 1881
J. L. Beard	Centerville	December 20, 1881
Dr. Geo. Bernard	Livermore	December 21, 1881
E. B. Smith	Cordelia, Solano County	December 28, 1881
G. Groezinger	Yountville, Napa County	December 28, 1881
Bernard Marks	California Central Colony, Fresno	December 28, 1881
H. A. Morrill	Wrights' Station, Santa Clara County	December 28, 1881
L. M. Holt	Riverside	December 28, 1881
A. J. Jones	Sonoma	December 28, 1881
R. M. Wheeler	Bello Station; P. O., St. Helena	December 28, 1881
H. W. McIntyre	Rutherford, Napa County	December 28, 1881
A. Brun	Oakville, Napa County	December 28, 1881
W. W. Lyman	Balls Station and Walnut Grove; P. O., St. Helena	December 28, 1881
Herman Schram	Schramsburg; P. O., St. Helena	December 28, 1881
F. W. Morse	Berkeley	December 28, 1881
Henry Mel	Vine Hill, Santa Cruz County; P. O., Glenwood	December 28, 1881
D. C. Feely	Patchen, Santa Cruz County	December 28, 1881
Leonard Coates	Magnolia Farm; P. O., Yountville, Napa Co.	December 28, 1881
Ezra Sanders	S. W. dist. Sonoma; P. O., Sonoma	December 28, 1881
Frank A. West	Stockton	December 28, 1881
M. Denicke	Fresno	December 28, 1881
F. A. Kimball	National City, San Diego County	December 28, 1881
Hon. J. F. Crank	Pasadena, Los Angeles County	December 28, 1881
Dr. James Blake	Calistoga, Napa County	December 28, 1881
Leon Lobe	Middletown, Lake County	December 28, 1881
Dr. J. Strenzel	Alhambra Vineyard; P. O., Martinez	December 28, 1881
A. J. Farley	Los Gatos, Santa Clara County	December 28, 1881
J. C. Merrithew	Vicinity of Blackberry Farm and Mountain View, Santa Clara County; P. O., Cupertino	December 28, 1881
Dr. J. W. Brotherton	Healdsburg, Sonoma County	December 28, 1881
J. Knauth	Sacramento	December 28, 1881
Felix Gillet	Nevada City, Nevada County	December 28, 1881
L. W. Buck	Vacaville, Solano County	December 28, 1881
General John McComb	Folsom	December 28, 1881
Hon. C. F. Reed	Grafton, Yolo County	December 28, 1881
B. F. Jackson	Woodland, Yolo County	December 30, 1881
Dr. W. H. Wells	Dixon, Solano County	December 30, 1881
Edward C. Judson	Lugonia, Crafton, and Redlands; P. O., San Bernardino	December 30, 1881
U. A. Boydston	Pleasanton	January 4, 1882

NAME.	Location.	Date of Appointment.
W. H. Robinson	Stockton	January 6, 1882
G. Geelmagden	Scandinavian Colony, Fresno	January 26, 1882
R. S. Mulholland	Church Colony, Fresno	January 25, 1882
Thos. Genley	Nevada Colony, Fresno	January 25, 1882
Gertie De Force-Cluff	Lodi, San Joaquin County	January 25, 1882
R. J. Trumbull	San Francisco	January 26, 1882
Frank Pellet	St. Helena	January 31, 1882
G. W. Moore	Santa Rosa, Sonoma County	February 5, 1882
Dr. Hyde	Fountain Grove Ranch, Santa Rosa	February 5, 1882
Thos. Perkins	Brighton, Sacramento County	March 18, 1882
J. Rutler	Florin, Sacramento County	March 18, 1882
Jas. Keer	Elk Grove, Sacramento County	March 18, 1882
M. Mertes	Dry Creek, Sacramento County; P. O., Roseville, Placer County	March 18, 1882
Thos. Hardie	Placerville, El Dorado County	March 18, 1882
Wm. Kramp	Diamond Springs, El Dorado County	March 18, 1882
Martin Alhoff	Coloma, El Dorado County	March 18, 1882
R. S. Chandler	Yuba City, Sacramento County	March 18, 1882
Mrs. J. C. Carr	Pasadena, Los Angeles County	July 15, 1882
Oscar Schopkf.	Bakersfield, Kern County	July 19, 1882
Miss M. F. Austin	Hedge Row Vineyard, Fresno	July 21, 1882
Henry Curtner	Harrisburg, Alameda County	September 11, 1882
Chas. Hadsell	Suñol, Alameda County	September 11, 1882
Anna L. Wetmore	Cresta Blanca; P. O., Pleasanton	September 11, 1882
A. Sbarboro	Truit Station, Sonoma County	September 11, 1882
J. W. Minturn	Minturn Station, Fresno County	September 11, 1882
C. K. Kirby	Fowler's Station, Fresno County	September 11, 1882
I. Landsberger	San Francisco	September 11, 1882
Mrs. Kate Warfield	Glen Ellen, Sonoma County	September 19, 1882
W. E. Cole	Red Bluff, Tehama County	September 23, 1882
Alex. J. Waddell	Gualala, Mendocino County	October 11, 1882
C. Gladding	Lincoln, Placer County	October 14, 1882
W. F. Brown	Orange, Los Angeles County	October 14, 1882
Mrs. W. A. Woodward	Penn Grove, Sonoma County	February 20, 1883
J. H. Wheeler	San Francisco	March 1, 1883
F. Hartung	Anaheim, Los Angeles County	July 17, 1883
W. T. Coleman	San Rafael, Marin County	July 17, 1883
Major Lee H. Utt	Pala, San Diego County	July 17, 1883
Cave J. Coutts	Guajome, San Luis Rey, San Diego County	July 17, 1883
Dr. J. O. B. Stillman	Lugonia, San Bernardino County	July 17, 1883
Ariel Lathrop	Vina, Tehama County	July 17, 1883
H. P. Livermore	Natoma Vineyard, Folsom	July 17, 1883
Capt. C. B. Westcott	Rocklin, Placer County	July 27, 1883
Frank McCoppin	San Luis Obispo	August 7, 1883
Hon. J. Routier	Routier, Sacramento County	August 23, 1883
A. Caminetti	Jackson, Amador County	December 11, 1883
Chas. Gardella	Mokelumne Hill, Calaveras County	December 11, 1883
S. Farjeon	Concord, Contra Costa County	March 10, 1884
Major G. F. Merriam	Vicinity of San Marcos Ranch; P. O., Apex, San Diego County	March 10, 1884
J. M. Asher	El Cajon, San Diego County	March 10, 1884
N. A. Eaton	Encinitos, San Diego County	March 10, 1884
J. C. Currier	San Miguel, San Luis Obispo County	April 2, 1884
Juan Gallegos	Mission San José	April 28, 1884
J. Q. A. Clark	Woodland, Yolo County	August 11, 1884
W. H. Bowman	Duarte, Los Angeles County	August 23, 1884
Seward Cole	Cahuenga District; P. O., Los Angeles, Los Angeles County	August 23, 1884
J. W. Byrne	Tustin, Los Angeles County	August 23, 1884
Miss Ada Camden	Blair, Shasta County	August 23, 1884

THE LABOR PROBLEM.

The approaching demand for competent labor in our vineyards and orchards should engage the serious attention of all who appre-

ciate the serious aspect of the question. Heretofore we have relied on nomadic supplies, without effort to secure a permanent population.

The great defect in our present condition in this respect is the want of well established village communities. Nearly all our new colonies have been organized on impractical views of future necessities. No provision has been made for the accommodation and convenient settlement of that class of people on which our fruit industries must depend for successful operation. The village centers have been devoted to fancy and æsthetic country houses, high real estate prices, and aristocratic tendencies. The contrary rule should prevail in country life, if it is intended to be practical.

Within easy walking distance of surrounding vineyards and orchards, small villages for the accommodation of the laboring classes should have been established. All the conveniences for such useful citizens, suitable to their necessities and economies, should have been thought of in proper time. The æsthetic farmer should not monopolize the centers of agricultural activity. Wherever communities have been formed, desirous of preserving, in common fixed notions of philosophy, or morals, the members of the same should have first taken care to provide themselves with plenty of muscle and industry to sustain themselves, if they desire to live apart from the contamination of mixed society. The proprietors of large estates have been content to herd their workmen as they would their cattle. Isolated planters have depended upon contract labor. All these conditions must soon change, and there is no time to lose in making proper arrangements for the reception of a more reliable class of working people.

It is easy to explain why the people we desire do not settle permanently in one place. Our tendency has not been towards diversified industry. Work has been offered only for short periods in each place, and, therefore, of necessity, families of the laboring classes have been forced to the cities, where they soon become absorbed in local industries.

If, to-day, a dozen Italian, Belgian, Swiss, German, French, or Scandinavian families should apply at this office for information as to where they might go to settle in a vineyard or orchard community, I could not advise them where to go and find such shelter as they require while waiting for an opportunity to obtain employment. An ordinary country hotel, which is too often managed on the theory of making the bar-room pay all the losses sustained in providing cheap boarding, does not offer the necessary inducements to attract temperate, frugal, and industrious families. The farmer who erects suitable cottages for the accommodation of such people is the rare exception, and no associated effort to provide village accommodations has been inaugurated.

Let me suggest the remedy, and trust to the good sense of all practical viticulturists and horticulturists to act in the matter. Let those who have some spare capital organize in each community companies for the encouragement of villages of working people. Purchase suitable tracts of the most fertile land, located centrally with reference to the district to be benefited; divide the same into lots of one acre or less; plant their borders with useful trees, according to the place, but especially the mulberry, if practicable; provide the means of obtaining water for irrigating garden vegetables, whether by ditches, steam power, or wells; erect cheap, comfortable cottages on a number

of them at once, and keep a supply of such tenements always ready for occupants; offer to rent these lots at a low rate, sufficient to pay ordinary interest on the investment, with the privilege of purchase at a fair price after one or two years' occupation and approval of the industrious character of the tenants; grant long time, with low interest, to the purchasers, if desired by them; and let the agent of the company be active in securing employment for the tenants. Then notify the immigration agents, merchants, Consuls, and others in San Francisco, that you have homes ready for people to occupy in the center of communities where labor is required for at least six months in the year. Having done this much wisely, do not be so foolish as to incorporate with your work any misdirected notions of controlling the habits of these villagers beyond what the proper administration of law and the preservation of public peace require.

Let the proprietor of large estates and the isolated vine-grower prepare as soon as possible to build similar cottages on portions of his land suitable to the wants of simple-minded people—where they may practice household economies, raise their chickens, feed a pig, and cultivate vegetables. For such homes, the mulberry tree, in time of need, will assist materially in keeping the wolf from the door.

With such preparation, we may honestly invite that class to come to us which we need; without it, we shall struggle for a long time with the labor problem.

THE PRESS.

Viticulture, as well as horticulture, is much indebted to the good will of the public press of the State for much encouragement and assistance. The journalists of the country are not slow to perceive and recognize all genuine developments of popular activity. The vine-grower has it in his power to reciprocate and to make his appreciation of services rendered felt in a practical way. The press should not have any reason to believe that its sympathy is unprofitably expended; it should know that vine-growers are a reading class of wide-awake citizens.

In this connection, I shall make some extracts from the report of the San Joaquin District Convention, as follows:

MR. HARASZTHY: We have among our visitors, representatives from two newspapers, who have come down here to gather items for their papers. It is our delight and our satisfaction to encourage these gentlemen in their endeavors to place before the public the proceedings of this Convention, and any matters of interest to the viticultural world at large. These papers are of immense advantage to the viticulturist who is unable to come from remote portions of the State. I allude to the *Rural Press*, represented by Mr. Wickson, and the *San Francisco Merchant* (then represented) by Mr. A. D. Bell. [Applause.] I will call upon Mr. Wickson to respond first, and afterwards Mr. Bell.

MR. WICKSON—Mr. Chairman and Gentlemen: We know that Mr. Bell is famous as a speaker and always says the right thing at the right time. I shall throw upon him the burden of responding to your pleasant sentiment. I merely extend to you my sincere thanks for your allusion. We are trying to do our duty to the industries of the State, and such industries are always welcome to any assistance from us. In order to be successful in our endeavors to be of service, it is necessary always that we should receive assistance from producers. It is impossible to sit in an office and make a good newspaper. We endeavor to report the results of all individual experiments, but in order to make this report it is necessary for us to hear from the person making them. We are always glad to hear from our subscribers and others; and with money and experience we hope to make a paper that will be considered of even greater value than it is now. As I have said, you will hear from Mr. Bell, on the value of the newspaper. I merely desire to extend thanks for the allusions you have made. [Applause.]

MR. BELL: My friend Wickson will go down to history as a truthful man. [Laughter.] I want to say this, that all newspaper men are very valuable, and so are some newspapers, but

every man who has one acre of ground, or who intends at some future time to have an acre or more of his own, should begin by subscribing to the *Rural Press*. He may be working in a bank for a hundred a month and attempting to reach his happy goal, but the *Rural Press* is worth more to him than his position in the bank. There are many papers in this State besides the *Press* and the *Merchant*, but they all quote from that good paper. It is full of information, and that is what makes it so valuable. The *Merchant* is indebted for its popularity to its personal friends—Professor Pohndorff and Professor Eisen for instance, for valuable contributions; that is what makes it valuable to you, and I think it is valuable because a number of gentlemen are helping me to do something, and you are kind enough to give me your encouragement in the shape of your subscription.

MR. HARASZTHY: Now, gentlemen, I have a very pleasant duty to perform, and that is, to propose the thanks of this Convention to the San Francisco and country press. The San Francisco publishers, against their own interests, have nearly without an exception, been the standard bearers of the viticultural interests of this State. I say this advisedly, knowing what I say. You will find the daily papers crowded with advertisements emanating from importers of foreign wines, of foreign raisins, and foreign fruits. Look over their pages, and how many advertisements do you find of native dealers, as compared with those of importers. When I say the press of San Francisco, I not only mean one daily, but every one. The importer says to the newspaper proprietor: "Why do you not crush out this native wine; why do you not advance the interests of the French vine-growers, when we are loading you down with advertisements?" But they have more pride in their State; more patriotism. They have a great industry to foster, and the almighty dollar in this instance is sunk in favor of a desire to foster the viticultural interests of this State. I will call upon Mr. G. W. Phelps to respond on behalf of the San Francisco press. [Applause.]

Mr. Phelps responded to the sentiment expressed by Mr. Haraszthy, and concluded by thanking him for his recognition of the press on this occasion.

The country press was ably represented on this occasion by Mr. Matthew Cooke of Sacramento.

PART II.

DEVELOPMENT OF VITICULTURAL INDUSTRY IN CALIFORNIA.

VITICULTURE CONSIDERED INDUSTRIALLY FROM THE STANDPOINT OF NATIONAL IMPORTANCE.

The relative importance of industries, considered from the standpoint of national stability, growth, and prosperity, depends upon the number of persons that are required to operate them in proportion to area of territory occupied, assuming that the means of alimentation can be procured either from the cultivation of the soil within the limits of the Nation, or by exchanging industrial products for the food of other countries. The study of hygiene, preservation of public peace, control of epidemics, preservation of the unity and purity of family life, and the love and maintenance of children, are consistent only when based upon the assumed capacity of agriculture to sustain life and the multiplication of industries to employ the healthful labor of increasing multitudes. Rapid and economical transportation become necessary for the distribution and exchange of labor products; education, social, intellectual, and æsthetic, coupled with freedom for desire and opportunity, create and maintain the wants that constitute markets. Assuming that agriculture has latent undeveloped resources for development, in proportion as there is poverty, disease, violence, and starvation to diminish the demand for food the profits and prosperity of the farmer diminish through over production, wasteful competition, and the drain of resources caused by the expense of distant transportations in search of markets. In proportion as the food consumers are free from class degradations, and as they are educated socially, morally, intellectually, and æsthetically, their wants increase, their demands for the fair exchange of labor products multiply, and the food producers prosper and advance apace with civilization. Where agriculture alone is encouraged education languishes, arts perish, labor is miserable, and wealth is controlled by a small class of importers and transportation agencies; in such case also agriculture depends solely upon the precarious and fitful demands of other countries, the conditions of commerce are beyond the control of the Nation, and the children of the farmer must largely emigrate to more civilized communities; genius, talent, ambition, will not remain in such a land, and freedom will vanish before the arms of invaders and the cupidity of capital.

Let the farmers of this country compare such a picture of purely agricultural development with the other extreme of national existence; compare it with the condition of England, where food is wanting, but where industry has courage, talent, genius, and military and naval power, guided by political sagacity, to forage on strange lands

for food supplies. Will they hesitate to choose which of the two evils they would prefer? And will they not in aiding in the development of this great Nation, aim to create an industrial and civilized England within an agricultural America?

Our inevitable national policy may be deduced from the consideration of these questions; inevitable, because our people are not a nation of fools, and do not intend to emigrate. Education, economical transportation, public and private morals, peace at home and abroad, equality before the law, and the rapid destruction of class distinctions, as the people, protected by a government of the people and for the people, become qualified socially for mutual and virtuous intercourse:—these are the foundation stones of our distinctive nationality. If this ideal has its enemies at home, it is because there are in all people conflicting principles of progress and retrogression, and because childhood has its peculiar perversities, born of undisciplined selfishness and lack of wisdom.

Viticulture, in professing to fulfill all the proper demands of the people as a progressive industry, conducive to public prosperity, happiness, and civilization, bases its claims for popular recognition and State and National encouragement and protection on the principles comprised in the foregoing general propositions. It has its enemies among political economists, who do not rightfully share our happy conditions of progress; and among reformers, whose notions of political power would lead them, if successful, to add to their present follies the religious intolerance of the past. It is, therefore, as necessary that we should discuss the principles of political economy and liberty, on which our ultimate success depends, as fully as we need to demonstrate the science and art that must govern the industry itself. This Commission addresses not only the viticulturist but also the whole people and their legislatures.

France and California are so nearly alike in extent of territory and agricultural resources, that it is to her that we may look for the most instructive lessons of experience. Dr. Jules Guyot, the celebrated scientist, who was commissioned by the French Government to make a study of the vineyards of that country with a view to improving their conditions, in the preface to his great work, which employed his undivided labor during four years, makes statements, which I translate as follows:

The vine occupied in France, in 1788, about 3,365,000 acres; in 1829, 4,975,000 acres; in 1849, 5,482,500 acres; in 1852, 5,750,000 acres; and, since that time, its area has extended until it reaches the figure, to-day (December 10, 1867), of 6,250,000 acres; more than the half of the total area of the wine-producing vineyards of the world; a little more than five per cent of the entire territory of France, and the sixteenth part of its arable soil.

The gross product of the vineyards of France is more than three hundred millions of dollars; their culture employs and supports one million five hundred thousand families, which means six millions of inhabitants, and more than two millions of accessory operatives, transporters, and merchants, constituting together at least the fifth of our population, and representing a production and consumption of more than four hundred million dollars.

The gross product of the vine constitutes a quarter of the total agricultural production (animals not included), realized from one sixteenth part of the arable soil. This product is, then, mathematically, four times greater, according to surface covered, than all the other cultures combined.

Wherever the vine ripens its fruit well, it doubles the revenue of estates, large or small, in which its culture covers one fifth of the area, if it is directed with intelligence and receives care and fertilizing in proportion to what is bestowed on other cultures.

The culture of the vine is among the easiest, simplest, and most lucrative. It yields remunerative crops after the third year of plantation. The vine adapts itself to all geological formations; it prospers in lands the most arid, and the least favorable to cereals, root crops, and hay; it is, therefore, by this fact, the complement of all good agriculture, while it is the silent partner

of the latter by reason of the money it produces—its strength and resource by reason of the hands and mouths that it supports.

Wine is the most precious and energetic of all alimentary drinks; its habitual use at the family table saves a third of the bread and meat; and, more than bread and meat, wine stimulates bodily strength, warms the heart, and develops the spirit of sociability; it gives activity, decision, courage, and contentment in labor and in all action. No drink, beer, cider, etc., can replace it in its happy and complete influence. Thus ought it to constitute soon the alimentary drink of all families, rich or poor, wherever civilization extends its blessings.

The normal consumption of wine as food, in order to give to human society its full force and activity of mind and body, should be at least equal to that of bread and its supplements; that would mean that France alone should consume two billion six hundred and forty million gallons annually, while yet she produces only from one billion three hundred million to one billion six hundred million gallons.

The great mind of Guyot enriched the agricultural wealth of France by instructing the producer how to make the most of his resources. He set an example of study that has since been followed by many intelligent students, who are perfecting and enlarging his theories of practical culture and vinification. This State is now drinking deep at the fountains of knowledge discovered in their books and illustrated in practical experience. The literature of France and Germany to-day is worth to us more than many mines of gold, and the students of other countries are adding their contributions to our industrial library.

In 1878, I investigated the condition and growth of viticulture in France and its influence upon the people. I found that during the decade preceding that year, the average annual production of wine in that country had increased to one billion five hundred million gallons, estimated according to the American, not the British, wine measure.

This production had increased in forty years from an average of seven hundred million gallons, by reason, probably, of diminished distillation and improved facilities for transportation, as well as by improved culture and increased acreage planted in the most fertile regions. Foreign commerce did not account for the increase, because during the same period exportations increased only from an average of thirty to an average of sixty million gallons annually, and now importations are in excess of exportations. The simple truth is, therefore, that practically the entire wine product of France is consumed at home; nay, more, it has proved, as railways extended their lines, insufficient for home demand, as is shown by the efforts of dishonest trade to swell the quantity by falsifications and the strong attempts of the Government to prevent the same. As Guyot said, France needs more wine than her vineyards supply, and, therefore, any improved methods by which the vines may be made to produce more without exhaustion would prove a national blessing, as well as to add profits to viticulture.

In the course of my investigations into the influence of wine production and consumption upon the health, morals, and happiness of the people, I consulted the ablest medical authorities of both England and France, and the records of accidents, crimes, suicides, and insanity. I became acquainted with some of the distinguished men composing the Society for the Promotion of Temperance in France, and, through Doctor L. Lunier, Inspector General of the insane asylums and of the sanitary conditions of the prisons of that country, Secretary of the society, I was elected as one of its corresponding members. I am in possession of all of its printed reports and of the most

important works published on this subject by many of the distinguished scientists and medical practitioners who are among its active members.

The statistical resources in France for the study of these questions are remarkably accurate and complete. All fermented and distilled beverages are so taxed that a perfect record of the consumption *per capita* of each kind in each department, commune, city, and town, can be traced. The tables prepared by Dr. Lunier show that the percentages of accidents, drunkenness, deaths, insanity, and suicides, attributable to alcoholic excesses, vary directly in proportion to the consumption of beet root, potato, and grain spirits, and inversely in proportion to the consumption of wine; that where wine is produced and consumed the most, the consumption of spirits decreases; that red wine districts show more favorably than the white; and that, even in the brandy-producing district of Cognac, the relations hold good as compared with white wine consumption, and the habits of the people do not lean to a large use of brandy. The evil results of alcoholic excesses are demonstrated as to the use of spirits, cider, beer, and wine, in the order named, in proportion to quantity consumed, being the worst in the case of the first, and least, if at all to be mentioned, in the case of the last. As illustrations, compare the following:

Department of the Gironde (including the maritime, commercial, and manufacturing City of Bordeaux) consumption *per capita* in litres, per annum: spirits, 1.36; wine, 180; cider, 0; beer, 3.73. Convictions for drunkenness in public, for each 10,000 inhabitants, in 1874-1876, 8.89; accidental deaths attributed to alcoholic excesses for each 100,000 inhabitants in 1872-1875, 0.74; insanity attributed to alcoholism, percentage of each 100 committed, in 1867-1869 and 1874-1876, 13.44; suicides from alcoholism, percentage of each 100, 12.60.

Department of Seine-Inférieure, under same heads as preceding: spirits, 10; wine, 21; cider, 79; beer, 9.60. Convicted of drunkenness, 76.62; accidental deaths, 1.84; insanity, 22.65; suicides, 9.99.

Department of Calvados, headings do.: spirits, 6.80; wine, 8.1; cider, 182.24; beer, 3.48. Drunks, 24.63; accidental deaths, 1.54; insanity, 29.37; suicides, 23.35.

Department of Nord, headings do.: spirits, 4.65; wine, 9; cider, 0.02; beer, 220. Drunks, 23.90; accidental deaths, 0.54; insanity, 8.78; suicides, 19.35.

Department of Charente (including the Cognac district), headings do.: spirits, 0.91; wine, 224.2; cider, 0; beer, 8.16. Drunks, 7.47; accidental deaths, 1.05; insanity, 12.17; suicides, 9.43.

These illustrate in brief, modified by occult causes, which in large cities and manufacturing centers, such as immoral habits, excitements due to business and depressions due to misery, what may be designated as the relative evil results of alcoholism, as shown in comparison with the popular beverages.

That practically no evil results spring from the use of wine, unmingled with other drinks, is shown by the record of—

The department of Aude, headings as before in the case of the Gironde: spirits, 0.90; wine, 260; cider, 0; beer, 8.74. Drunks, 2.80; accidental deaths, 0.08; insanity, 9.08; suicides, 0.

That a low average *per capita* consumption of wine, together with even as low an average as in Aude with respect to other drinks, does

not effect a better showing, is demonstrated by the record of a very abstemious population in—

The department of Haute-Savoie (Alpine District), headings as before: spirits, 0.37; wine, 38.4; cider, 1.98; beer, 2.47. Drunks, 16.77; accidental deaths, 2.29; insanity, 13.22; suicides, 5.56.

It is apparent that in Haute-Savoie neither fermented nor distilled drinks are popular at the family table; that the spirits are probably German potato whiskies; that the absence of wine at the table sends those who drink to the cabarets or saloons; and that the evils of intemperance, small as they are, are worse than in Aude where 260 litres (68.64 gallons) are consumed *per capita*, without any apparent evil results that may not, from an examination of these records, be attributed to the small proportions of other drinks consumed in the community. Aude, with its 68.64 gallons of wine consumed annually *per capita*, is practically a strictly temperate country, showing less danger from the bountiful use of wine than can be shown from smuggled alcohol in the most strictly governed prohibition communities of this country.

A careful study of statistics, together with personal observation of the habits of a great wine district, demonstrate that the free use of pure wine as a daily food leads to no excesses whatever that terminate in alcoholism or drunkenness and their attendant accidents.

As to the health of wine-drinking communities—where wine is a daily food—I could find no traces of special diseases attributable to its use. I could find no reference to such on the part of medical authorities. In such places liver complaints, kidney troubles, etc., were not more conspicuous but apparently less so than in other countries; and in respect to sound digestion and general good health, especially of women, the comparison was always in favor of the wine drinkers.

As to evidences of popular happiness and content, we have only to observe that gay songs, bright faces, and alacrity so characterize the people of wine countries, and their contentment is so well proved by their reluctance to emigrate, that we have only to witness the tired stullenness and silence that brood over the dinner hour of the American working people, who drench their stomachs at morning with a flood of bad coffee, soak their hot food at noon with cold water, fill a tired stomach in a tired body at night, without pleasure and convivial expression to revive tired spirits, and relieve their minds either by evening dullness, or even bad temper, or by spirituous excitement in the drinking saloon—we have only to witness these things to cause us to wish God-speed to viticulture.

As to evidences of the influence of viticulture as an industry, giving employment to one fifth of the population of a great Nation, on the wealth and general prosperity of the people, we have only to point to France in our times, as we have seen her emerging from a great war, paying off her great debt, proceeding peacefully with her industries, engaging in great enterprises, exploring and colonizing Africa and Asia, building interoceanic canals, engaging in foreign wars, and, even under a republican form of government, attracting to her capital annually thousands of our most intelligent travelers, students, and pleasure seekers.

As to public and private morals, those who would judge France by the floating population of strangers and pleasure seekers, which is catered to by the professionally dissolute classes, should, if in this

country, institute the comparison by first studying life at Saratoga, Long Branch, and the "Thoroughbreds" of New York. If they would judge her by the home life of her producing classes, they will confess that, as travelers, they have not seen the inside of French homes, which are protected by customs, peculiar to her people, from the knowledge of strangers.

As to the administration of justice and the honorable discharge of public trusts, France shows no demoralization resulting from the consumption of fifteen hundred million gallons of wine annually, and the absorption of one fifth of her population in viticultural industries.

As to the advancement of arts and sciences, we see no decadence from the use of wine; the greatest scientists and artists are wine drinkers, and to Pasteur, who occupies the public mind more than any other to-day, viticulture owes its greatest impulse in perfecting methods of fermentation.

As to the preservation of the idea of personal liberty, equality, and fraternity, wine proves no degrading influence. Surrounded by greater obstacles than have been encountered by any great Nation in the progress of popular development, France, in our times, coincident with the vast increase in the productions of viticulture, has achieved republican freedom and stands to-day the peer of European nations.

There are those who confound the results of race characteristics, social oppressions, and ages of ignorance among working people, with the results of wine production. Let those, who desire to make fair comparisons, institute them between those eastern countries within the zone of viticulture, where the industry is fostered, and where it has been interdicted. Compare Greece, even in her decline, and Italy with Turkey, Egypt, Arabia, and Persia. Compare prohibition Palestine with ancient wine drinking Judea. Compare peasant life of France and Germany with that of Russia. Viticulture will not shrink from learning any useful lesson that may be drawn from the experience of the world as taught by science and honest investigation.

Happy California! She, who may rival France in viticulture! Happy United States of America—Columbia! She, who counts the star of California on her national flag! Happy San Francisco! She, who will become the Paris of America! Happy may our enemies be, those who predict debauchery, crime, poverty, and public decadence, as the outgrowth of viticulture, if they may see forty millions of people supported on the soil of California, as happily situated as those of wine-blessed France! Happy viticulturists of California! When public sentiment boasts of your achievements, and crafty politicians do not disguise their friendship! Unhappy Iowa! For she has lost personal liberty, and may look to her present rulers for their next attempt, which will be to engraft ecclesiastical intolerance in the constitution of her government!

THE GROWTH AND PRESENT CONDITION OF VITICULTURE IN CALIFORNIA.

Viticulture was introduced into California by the Franciscan Fathers, who established the first civilization on this coast. Their first Mission was founded at San Diego in the year 1769. As soon as they had securely commenced their work of proselyting the native Indian

tribes, bringing them to engage in industrial pursuits in the vicinity of the Missions, they planted the vine, olive, fig, pomegranate, date, palm, and pear. Relics of these early plantations are still in existence. The orange and lemon appear also to have been cultivated; but at what period they were introduced I have not learned. Cereals and leguminous plants, cattle and horses, were also objects of their industry.

A variety of the *vitis vinifera*, bearing large loose clusters of black grapes, was propagated at all the Missions in favorable situations. This variety is now known as the *Mission* grape. If it came from Spain or Mexico directly, or was produced from seed, is not now known. Certainly it bears no resemblance to any variety that has since been imported from Europe, or that has been described in any work on ampelography that we can find. That the Fathers, considering their great resources at that time, would have neglected, if they made their selections in Spain, such noble vines as the *Pedro Ximenes*, *Grenache*, *Carignan*, and *Moscatel Gordo Blanco*, is not to be supposed. That it may have been considered by them impractical to preserve vine cuttings, or roots, in those days of long voyages, is not improbable. That they attempted to propagate the vine, olive, fig, pear, and other fruits from the seed, is not only reasonable to think, but that they did so is made apparent by the distinctive characteristics of the relics they have left to us in their orchards and vineyards. The identical and rustic natures of the Mission vines, olives, and figs makes it also appear that the seedlings were first produced in Mexico, where the most vigorous varieties were undoubtedly selected for the California Missions. If the *Mission* grape was a popular variety in Spain a century ago, it has certainly disappeared as such before the hand of the skillful cultivator, as it is now disappearing in many sections of this State.

In some of the old vineyards, planted from stocks obtained from the early Missions, there is yet to be found a white variety having a delicate Muscat flavor. This may have been a seedling of the *Muscat blanc* of Frontignan.

Soon after the cession of California to the United States, some of the new settlers, seeing the fertility of the Mission vine, and being acquainted more or less with viticulture, conceived the idea of abandoning gold hunting and engaging in wine making. Among the most prominent of these pioneers were Colonel Agoston Haraszthy and Charles Kohler. The latter may be styled the pioneer and founder of the present wine trade of California. Mr. Kohler became, not only a wine maker and merchant, but also a vine-grower. He is still a leader of the industry, operating large vineyards in Los Angeles, Sonoma, and Fresno Counties, and conducting mercantile business in wines and brandies in San Francisco and New York.

Colonel Agoston Haraszthy, the honored father of our worthy President, brought with him a knowledge of viticulture acquired in Hungary, his native land. More than thirty years ago he commenced to propagate vines in San Diego; thence, he transferred his nurseries to San Mateo, and afterwards to Sonoma County. He collected by direct importation and from others engaged like him, a large number of varieties, among them the *Zinfandel*, which he knew in Hungary. This vine he imported and propagated with so much zeal, and urged its adoption with so much success, that it now dominates among the red wine varieties in our vineyards. It was the first vine to give

extended popularity to our clarets. In 1859, he was appointed by the State as the leading member of a Commission to study the vineyards of Europe and to make collections of desirable vines. He traveled throughout France, Germany, Spain, and Italy, made collections of vines and acquired information, all of which was freely devoted to the advancement of the industry on this coast. The catalogue of his nursery comprised the greater portion of the noble vines of the world, and as a matter of history, was reprinted in the first annual reports of this Commission. It would not be true to history, if we did not record the fact, that the action of the State was at that time merely in conferring an honorary distinction without expense to the people. Colonel Haraszthy traveled and made his collections at his own private cost. If the State at that time had realized the importance of the work undertaken, and provided for popular instruction in viticulture, especially as to the relative merits and uses of the different varieties introduced, we should have been far more advanced in the quality of our products than we are to-day.

Colonel Haraszthy founded the Buena Vista Vineyard at Sonoma, and made many experiments in the attempt to reproduce there types of foreign wines popular in commerce. He was one of the first to demonstrate the practicability and general superiority of wine vineyards cultivated without irrigation, and taught the doctrine that careful selection of varieties would control the quality of our products. From his collection, among many others, were propagated the now popular varieties of table grapes, the Flame Tokay, and Emperor, and the *Muscatel*, which passes sometimes under the name of *Moscatel Gordo Blanco*, *Muscat of Alexandria*, and *White Muscat*, well known to the raisin makers and the shippers of table grapes. Mr. R. B. Blowers obtained his *Muscatel* and *Emperor* stocks from Col. Haraszthy, giving the name *Emperor* himself to a variety, the true name of which had been lost and to this time not recovered. The necessities of business led Colonel Haraszthy away from this State before he had completed his labors, and he left this life without realizing the great and honorable reputation, which has become the legacy of his children, two of whom are following in the path that he so wisely pointed out.

Contemporary with Colonel Haraszthy were a number of enthusiastic citizens from France and Germany, who imported favorite stocks from their native lands, and laid the foundations of vineyards that are now successful.

The Germans adhered, however, generally more closely and persistently to their enterprises and propagated with more systematic effort the noble varieties of the Rhine, leading among which has been the *Riesling* (called Johannisberg here), and the *Sylvaner* (or *Franken Riesling*), *Orleans*, *Gutedel*, *Traminer*, and a variety called *Burger*, which is not the well known *Burger*, or *Weiss Elbling* of Germany. It is a question whether the so called *Golden Chasselas* of St. Helena came in their collections, or whether it was accidentally misnamed after coming from Colonel Haraszthy's collection of Spanish varieties. The systematic plantations of these German collections won the first victory for quality in our white wines, which became popular in the markets before any of our clarets gained public recognition.

The French varieties, as well as the large collections made by Colonel Haraszthy from all sources, fell generally into the hands of planters, who either abandoned their enterprises before perfecting

them, or who were not acquainted with their relative merits and proper methods of culture. A few, notable among whom are Mr. Chas. Lefranc and Mr. P. Pellier, preserved and propagated collections, now extant, which have been of recent service. The noble varieties of wine grapes of France and Germany, with few exceptions, require long pruning, special care, and adaptation to soil and climate, in order to produce profitable results. Until comparatively recently all varieties were subjected to the same treatment, and were tested without reference to adaptation to soil and climate. The practice of pruning on arms, after the goblet style, with short spurs, which had been learned from the Mexicans in cultivating the Mission grape, was applied to all alike by nearly every vine-grower. Each one experimented first with promiscuous varieties and selected for continued propagation those that yielded by their methods the largest crops. At one time even the *Riesling* was in danger of being sacrificed as an unprofitable vine; indeed, so few understood it that until very recent plantations it entered into very few vineyards for more than a small proportion. The *Riesling* wines of our commerce have therefore been largely blended with coarser products, and the true capacity of our State to furnish the Rhenish types of good quality is not yet well known to the general trade outside the State. In this respect, as in others, the surprises for the eastern markets that our new vineyards promise within the next three years can scarcely be appreciated at present. By the unfortunate system of selection adopted the choicest of French, Spanish, and Portuguese varieties were sacrificed to the test of quantity by short pruning. The result has been that the original collections of noble stocks were mostly lost to identification and forgotten by name until the organization of this Commission, when a new impulse to systematic viticulture was given. The *Trousseau* was neglected for the *Charbono*, the *Sauvignon blanc* and *jaune* for the *Colombar* and *Folle Blanche*, and the Bordeaux claret and Burgundy stocks were practically abandoned, the small proportions existing being drowned beyond recognition of their quality in thousands of gallons of coarser grades.

To explain the peculiarities of our wines to those who have looked for reproductions of celebrated European wines in our general stocks as handled by the trade, and who have asserted our inability to produce them, it is necessary to say that among the bearing vineyards of the State, with the exception of the Rhenish stocks, the Hungarian *Zinfandels*, and two plantations of the Roussillon varieties (*Mataro*, *Carignan*, and *Grenache*), there has not been found a single bearing vineyard planted systematically with the varieties necessary to reproduce the types of Bordeaux clarets, Burgundies, Sauternes, Hermitage, Portuguese port, Spanish sherry, Madeira, or Cognac. The few Roussillons and an acceptable type of Sauterne from the *Colombar* blended with other varieties, have been consumed in local markets. A very limited proportion of *Chauché noir*, *Trousseau*, *Charbono*, and of such uncertainly named vines as *Crabb's Black Burgundy*, with scattering small lots of *Mataro*, have found their way to market in blends of selected stocks. Sweet ports have been made specially from the *Mission* grape, with recently in some places an addition of *Zinfandel* and the so called *Black Malvasia*. Sherries have been produced after the French rather than the Spanish rules, and from any wines that presented heavy types and an approximation to the popular notion of sherry flavors. Sweet wines of original types have been

very successfully playing the roles of Malaga, Madeira, Angelica, etc. Brandy has been of three leading classes, viz.: distillations direct from the Mission grape without excluding the wine fermented on the skins, and without blending varieties to produce aroma and bouquet; brandy from the pomace, or refuse of the wine press, and from wine that has been rejected on account of defective fermentation; and new types of original character unknown to commerce, such as General Naglee's products from the *Charbono*, with small admixture of *Trousseau*. Few exceptions can be made to this statement as to brandies, such as the recent distillations of Mr. George West, from his *White Prolific* (true name unknown), which resemble Cognac in character.

Exceptionally good lots of wines and brandies have been made at different times from small lots of grapes of fine quality, such as Mr. Lefranc's *Malbeck* of a few vintages, Mr. George West's *Frontignan*, Mr. Bugbey's (very small lot) *Verdelho*, Mr. J. H. Drummond's (experimental work) *Cabernet-Sauvignon*, *Petite Syrah*, and *Semillon*, Mr. Wm. Scheffler's *Burgundy*, Mr. J. B. J. Portal's *Ploussard*, and Mr. L. J. Rose's and Mr. George West's *Trousseau* port of true type. The most numerous samples of experimental wines, not offered for sale, but which have convinced those who have seen them of the practicability of reproducing the noble types of Europe, have recently been shown by Mr. H. W. Crabb, Mr. J. H. Drummond, and Mr. Horatio Livermore, Manager of the Natoma Vineyards.

As the general market knows our wines and brandies, with the exception of German White Rhenish types, *Zinfandel*, and a few blends, slightly improved by a little *Mataro*, *Charbono*, *Trousseau*, *Chauché noir*, and *Crabb's Black Burgundy*, our stocks have not been produced from systematically selected varieties, planted with reference to the reproduction of popular types known to the world.

In champagnes, Mr. Arpad Haraszthy has made a signal success in producing a type, after the true manner of fermentation as practiced in the celebrated champagne district of France, which differs from French champagne in character not much more than Mumm's brands differ from Roederer's, but which owes its peculiar flavors and bouquet to the white juices of the *Zinfandel* and *Burger*, while those of France owe theirs to the *pinot* family, and other less noble stocks. The Burgundy and champagne *pinot* varieties have not been cultivated in California in vineyards, now bearing, in numbers to affect products appreciably. A sample lot of the champagne stocks, planted by Mr. Benson, will be tested this year.

The foregoing explanation of the sources of our present market wines should prepare our distant friends for new experiences, when new qualities are offered from the vineyards that have been planted during the last four years. These new vineyards necessarily show a predominance of those varieties which were attainable in sufficient quantities from the vineyards already in bearing. The general average of quality has, however, been very materially raised by discarding the least valuable among the prolific varieties, such as the *Mission* and *Black Malvasia*, and by increasing the value of *Zinfandel*, *Charbono*, *Burger*, *Chasselas*, etc., which generally have given fair and sometimes superior products, by adding certain proportions, as the stock of cuttings has permitted, of Burgundies, *Trousseau*, *Chauché noir*, *Malbeck*, *Mataro*, *Carignan*, *Grenache*, *Ploussard* (of red wine varieties), and *Colombar*, *Folle Blanche*, *West's White Prolific*, *Riesling* (Moselle, Johannisberg, Franken, and Orleans), *Frontignan*, and *Verdelho*. Col-

oring wines from the *Lenoir*, *Gamay Teinturier*, and the Bouschet hybrids will also soon make an appearance.

With a largely increased area in the best varieties now known to the market, improved by the absence of blends with *Mission* and other inferior stocks, which will soon, except for special purposes and some sweet wines, be sent to the distilleries, and by the addition of certain proportions of the nobler stocks and of those having special value for their tannin and coloring contents, the wine markets within the next three years will witness a veritable revolution of general average quality. The improvement will be specially noticeable in dry reds (of Bordeaux and Burgundy commercial types), sweet reds of true Oporto character (the *Trousseau* or *Bastardo* having been specially and extensively propagated for this purpose), Rhenish Whites, fair substitutes for light Sauternes (from *Colombar* and *Folle Blanche* with appropriate blends), and good approximations to high classed young Cognacs, if not their equals. Wine dealers will understand that I am using words critically, and that such brands as I refer to as the certain results of the next few vintages will be far superior to the average imported grades of similar pretensions. My intention always is to furnish to commerce a correct guide, suited to the critical standpoint of trade, so that it may know what to expect and how to prepare for what is coming. We shall appeal to the wine dealers throughout the United States to assist and encourage our producers in their present endeavors to raise the standard of quality in their products. If this appeal should fail, either this Commission will have preached sound doctrines in vain, or our producers must vindicate our wisdom by organizing and controlling the wine trade to suit their own proper ambitions.

In the near future the wine dealers may prepare also to provide a market for clarets of high Médoc character, true high class Burgundy, true Sauternes, and Cognac types that will rival the best produced and surpass any in general commerce. High-classed sherry is a thing yet for experiment, the necessary preliminary test samples not yet having been produced. Fine sweet wines and cordials can be produced whenever the trade will indicate the demand. In this respect there is no doubt of complete success; and with respect to the Oporto type the vines are now beginning to bear that will distance all possible competition from abroad. It remains only to be seen whether the consumers prefer corn spirits, flavored and sweetened with glucose syrups. So far as good dry wines and fine brandies are concerned, we know that nothing stands in the way of our markets except the cupidity of many retailers, whose dishonesty must either be restrained by their own good sense or by the hard hand of the law.

Many of our most progressive planters, particularly some of those who possess sufficient capital to hold wines until maturity, are making rapid progress towards the reproduction of the finest possible types by grafting old vines with imported cuttings. These will commence to make their showing within three years, but how long before they pass the limits of local demands is not so clearly stated. They will find many more to follow their example, if practical results follow their first attempts, and the transformation of lower grade vines by means of grafting will work astonishing wonders in a few years. The question with them will be, will the market pay for high quality that has been attained at a sacrifice in quantity?

Dealers who have been accustomed to believe that fine wines require many years of maturing, will learn that this process, for reasons not necessary in this connection to discuss, is much hastened by natural causes in California, as shown by present experience.

We have no means for procuring exact estimates of the areas of vines planted throughout the State. The Assessors fail in every case to obtain even approximate returns. Our own estimates are based on better opportunities to judge the facts and a disposition to learn the truth. Prior to 1880, the extent was variously estimated at from fifty to sixty thousand acres; the former figure is probably nearest to the truth. Since that time about one hundred thousand acres have been planted, and the disposition to increase the work still further continues. As long as many soils suitable for vines fail to produce profitable crops of cereals, and real estate operations make them too high priced for grazing, and as long as a tide of immigration seeks our climate for congenial occupation, this industry will continue to grow, checked only by temporary fears of over production.

On December 18, 1883, I made for the use of the press, an estimate of vines planted and probable vintages for coming seasons up to that of 1888, as follows:

Area of vines planted prior to 1881 and now bearing well, about 60,000 acres; planted in 1881, about 10,000 acres; in 1882, about 35,000 acres; in 1883, about 35,000 acres. Estimated to be planted in 1884, if weather is propitious, 30,000 acres. There will be in 1885, 70,000 acres five years old and upwards; in 1886, 105,000 acres five years old and upwards; in 1887, 140,000 acres five years old and upwards; in 1888, 170,000 acres five years old and upwards. The percentage of table, shipping, and raisin grapes, about twenty per cent; balance for wine and brandy.

Wine crop for 1881 was about 12,000,000 gallons; for 1882, about 9,000,000 gallons; for 1883, about 8,000,000 gallons. Estimates for 1884 (normal yield) 14,000,000 gallons; for 1885 (normal yield) 15,000,000 gallons; for 1886 (normal yield) 20,000,000 gallons; for 1887 (normal yield) 25,000,000 gallons; for 1888 (normal yield) 33,000,000 gallons.

These estimates include brandy—each gallon of brandy represents about four gallons of wine distilled; so that if one third be distilled in 1887 we shall have about 16,000,000 gallons wine, and about 2,000,000 gallons brandy. In 1888 we shall have about 22,000,000 gallons wine, and nearly 3,000,000 gallons brandy.

I am inclined now to believe that the estimate of vines planted prior to 1881 was too large. I adopted the figure as it has generally been fixed by vine-growers; 50,000 acres would probably be near the truth.

The last planting season was unfavorable on account of the dryness in the early part, and the excessive rains later. Many prospective vineyards were delayed or abandoned. I cannot form a very clear conception of the acres added, but the figure might reasonably be fixed at 20,000. These modifications, if correct, would reduce the estimated acreage of bearing vines for 1885, 1886, and 1887, by 10,000, and that of 1888 by 20,000. So much margin was, however, allowed for partial failures of crops that the estimates of wine products may not have been too great. That of this season is now estimated in advance at 15,000,000 gallons from appearances in the field.

The prices paid for grapes at wineries, where distillation and sweet wines are not the chief products, but where dry wine is generally attempted, varies from twenty-five to thirty-five dollars per ton of variously proportioned varieties, and from thirty to thirty-five dollars for certain select qualities. Forty dollars would probably be paid for sufficient quantities of such varieties as *Cabernet-Sauvignon*, and certain commercially valued coloring stocks. In the same districts the new wines of recent vintages have correspondingly varied from

twenty-five to thirty cents per gallon, naked, and delivered at the railway stations in coooperage furnished by the purchaser. Special lots from comparatively scarce varieties of French wine grapes of not high quality, but valued for blending with light Zinfandels of poor color and character, have sold as high as thirty-six cents. Probably, if whole cellars of unblended Riesling could have been obtained, the price for them would have ruled at from thirty-five to forty cents under like circumstances. Inferior cellars unrelieved by certain fair proportions of the best average qualities have generally sold at from twenty to twenty-four cents.

There is no way to determine what the values of the wines would have been if aged one year at the vineyards. Those producers who have kept such wines generally do also a mercantile business, and sell direct to the consumers, retailers, and jobbers. In such cases mercantile profits are generally added, and the wines may range, according to quality and quantity sold, at from thirty to forty-five cents per gallon, small lots of single barrels to consumers even at prices from fifty to seventy-five cents. The cases where one dollar per gallon is charged are not numerous, and do not represent any considerable trade, unless it may be in the case of high classed Rieslings.

Considering the prices as for average bulk lots, grapes, or new dry wines (naked), in well established districts, and for vineyards of the best average quality, yielding about four tons of fruit to the acre, we may arrive at an estimate of income as follows:

Grapes sold to the wineries, \$100 to \$120 per acre; cost of good culture, picking, and delivering crops, \$30; net profit, \$70 to \$90 per acre.

Wine (estimated at one hundred and thirty-five gallons per ton and eight gallons of pomace brandy), sold new and naked, \$135 to \$162 per acre; add thirty-two gallons of brandy at seventy-five cents (generally more has been realized, but the tendency is downwards for pomace brandy), or \$24 per acre. Some of the larger establishments probably make the brandy pay all or nearly all the cost of making the wine.

Most of the wine makers have been struggling without much capital and paying large rates of interest to establish themselves, and have frequently suffered losses from imperfect fermentation, fires, etc.; so the rate of profit has not been more than they deserved.

The statements made should cause planters to consider the importance of combining wine making with grape growing. This will be the more desirable in cases of small vineyards, where the crop does not exceed three tons to the acre, and where the finest varieties are grown, for to get the full benefit of fine varieties they should be carefully fermented by the grower, who understands them, and kept apart from inferior stocks which would serve only to drown them out of sight of trade. Producers need not fear that the choicest varieties, neglected in the past, especially in the case of the best claret grapes well adapted to soil and climate, will ever bring less prices than the better average grades now do, say, thirty cents a gallon for wine; on the contrary, with increased production, the tendency is towards lower prices for inferior wines, higher prices for the most select and uncertain varieties, though general stability for the good averages, which now constitute our best general trade stocks.

The probabilities and certainties of success in planting and wine

making may be deduced in a measure from these statements; the direction of probable risk is the same that leads to a low reputation for our products.

The production of high classed wines, aged many years, and sold in glass, will certainly never be more generally popular, or safe as a general occupation, than in other countries. France, when producing fifteen hundred million gallons of wine, never probably surpassed ten millions of so called "fine" wines. The department in which Bordeaux is situated, and the center of trade for the most celebrated wines of foreign commerce, produced only three millions of gallons of classed "fine" wines, out of sixty millions total product.

"Fine" wines never become articles of daily food to the substitution of lighter ordinary clarets, sauternes, hocks, etc., on the tables of any very intelligent and experienced people of the most wealthy classes, and much less so with those of less resources.

We need good sound commercial wines, ranking in competition with French products, as *bon ordinaire* and *supérieure*. We need something better than the simply *ordinaire* wine to win our way to new markets, and to compete against beer. To accomplish these results, we need to associate in our vineyards, together with about two thirds of such good fertile stocks as *Mataro*, *Zinfandel*, *Crabb's Black Burgundy*, and *Carignan* (reds), *Colombar*, *Burger*, *Golden Chas-selas*, and *Folle Blanche* (whites), about one third proportion of some of the nobler or variously valued less fertile varieties, such as *Mal-beck*, *Cabernet-Sauvignon*, *Burgundy Pinots*, and *Trousseau* (reds), *Ries-lings*, *Sauvignon-blanc*, *Semillon*, *Raisinotte* (*Muscadelle de Bordelais*), *Traminer*, *Pinot gris*, and *Chardenai*. To supplement these for blending purposes, the trade will demand stocks of tanniferous, coloring, and certain flavoring wines, such as *Grosser-Blauer*, *Tannat*, *Lenoir*, *Petit-Bouschet*, *Alicante-Bouschet*, *Gamay Teinturier*, *Frontignan*, etc.

Whether wine-making is to be practiced or not, all plantings of wine grapes should be made with reference to wine making, in order to preserve true proportions in the crops of the State.

Those few who aim at the production of "fine" wines must be the most careful in selection of climate, soil, and exposure, and noble varieties, and must look well in the face all the necessary appliances, such as cellars to mature and store several vintages, and they must be content to wait longer for their profits. That there will be a good market for a certain large production of "fine" wine, there is no doubt, but none should undertake this branch of production who do not fully comprehend all its necessities.

Those who imagine that they are acquainted with truly high classed wines, because they have consumed products labeled "Chateau La-Rose," etc., know as little of the true labels as they do of the wines. Governor Stoneman is as likely to sign his name to a business letter as "His Excellency Governor Stoneman," as the proprietor of the Chateau *Gruau-LaRose* or *Leoville-Barton* is to use the word Chateau on his wine bottles. Wines selling under such labels as are common to the hotel wine lists, are generally not equal in quality to a nameless *bon ordinaire* of Bordeaux, but actually pass the custom houses under the contemptuous commercial title of *vin de cargaison*—cargo wine.

I have referred to the prices of our best average commercial lots of dry wines. There are sections of the State which, either for want of better fermenting facilities, or for want of better proportions of good

varieties of vines, suited to the climate and soil, which do not enjoy the profits named. In such districts prices generally vary from eighteen to twenty dollars per ton for grapes at the wineries or distilleries, the cost of transportation long distances to the purchasers often reducing the profits materially. The growers in such places should secure better stocks by grafting and make their own wines.

The mercantile prices for wines in large stocks are very reasonable. After paying for cooperage, transportation from the country, maturing, blending, commissions, or traveling agencies, they deliver good fair dry wines, free on board steamer or rail, at from forty to forty-five cents per gallon. Certain selected lots may rule higher; but it may be said that the bulk of our average good stocks may be had, delivered to the trade in New York, at from fifty-two to sixty cents per gallon. Before these can reach the consumer or retailer, who is not sufficiently well informed to order direct from leading houses by the barrel, the expenses and profits of the New York agencies, jobbers, and commission agents, must be added. A well managed trade, however, ought to place good California clarets in the hands of retailers through New York agencies at a price of not exceeding seventy-five cents per gallon, cost of transportation to country places added. An addition of ten cents per gallon ought to cover all present differences of quality above present ordinary averages, and an addition of fifteen more ought to reasonably cover the cost of procuring our best young wines as new plantings develop them. In other words, without lowering present profits to the wine-growers, the trade ought to be able to place wine, much better than the ordinary grades of imported French wines, in the hands of retailers in New York at not exceeding one dollar per gallon, as soon as our producers have it for sale, which will be within the next three years, and good, sound, ordinary wine at not exceeding seventy-five cents—which latter figure represents seven and one half cents per contents of the regulation pint bottle, which can be sold at fair profit for ten or twelve cents by restaurants, or substituted in slightly reduced volume, without extra charge, by hotels, for tea or coffee.

I have not referred to the prices of sweet wines and brandies; these being more easily transportable, are well understood by the trade. The cost of fortifying the former with brandy, or spirits, which all sweet wines contain to preserve them from fermentation, should be decreased by Congress, inasmuch as the wines of this class that we compete against are fortified with free spirits. In other words, the port and sherry wine shipper at Certe, France, can, or could recently, buy American corn spirits in bond at Marseilles at about twenty-five cents per gallon, while the same goods must cost for our wine makers the additional price of ninety cents per gallon internal revenue tax, and if using brandy, he uses still more costly material. Our dry wines need no distilled spirits, hence the question does not pertain to them at present, although in sending some grades of rich wines to hot climates it may become necessary, as is practiced in Europe, to add about one per cent of spirits, which should be permitted free of tax.

Choice brandies from two to three years in bond, have been sold in trade at about two dollars and a half per gallon, tax paid; small lots, to retailers and consumers, at from three to four dollars. Ordinary brandies, in large lots, at from one dollar to one dollar and a quarter, in bond, to the trade; certain lots at less figures.

The finest average brandies that we are capable of producing can be profitably sold new, at the distillery, in bond, at one dollar per gallon, which would represent about thirty-five dollars gross per ton of grapes, or about thirty dollars net. Vineyards for such purposes can be planted where the average crop of *Burger*, *Folle Blanche*, *Colombar*, and *West's White Prolific* would be about six tons to the acre. It is evident, therefore, that the brandy trade should be able to work off any surplus stocks of wine grapes with profit at even lower figures, if necessary.

At present the demand for brandy appears to be slack. This fault can be speedily remedied by the production of much finer goods to compete against whisky. Pomace brandies and those distilled from very ripe grapes of poor quality, especially where the juice has fermented on the skins, will not successfully contend against corn spirits, which are cleaner to the taste, if they are not better to the blood. A fine cognac type, which we are capable of producing in great quantity, should successfully enter the market. Plantations, with the cognac type in view, have been made, and before long the trade can test this question.

A brandy of original type has been placed on the market by one producer, but his system of paying tax and keeping in his own cellars for maturity, makes the cost too high for general trade, and his example will find few imitators.

Grapes for shipping east by rail have sold at prices ranging from forty to one hundred and fifty dollars per ton, the general average being about fifty dollars, excepting this year, which records at this time about seventy dollars. Recently the eastern demands have increased for favorite varieties faster than the new vineyards can be brought to bearing. Large crops will no doubt reduce the prices to normal conditions. Unless shipping grapes bring at least forty dollars per ton, growers will prefer to graft over to wine varieties selling at considerably less, on account of the extra expenses of picking and assorting the former and the losses sustained from the small value of the refuse bunches, which will not be profitable to the shipper, but which must go to the vinegar factory or distillery.

While improved facilities for trade and mercantile competition have steadily reduced the prices of our wines to the retailer, the constantly increasing demand and more critical taste of consumers have in like degree advanced the prices paid for grapes and new wines in the country. The facilities granted by the law for bonding spirits have rendered it practicable to distill at reasonable profits and so to relieve the wine markets in a measure of inferior grades. The brandy law is, however, still very defective. Wider facilities for transporting in bond and regulations for the change of size of packages and refilling loss by evaporation under distillers' stamps are required. The producer has also the right to demand of the Government the right to hold his goods until they are properly matured before being compelled to sell them.

The enforcement of a heavy tax on production before the distiller has matured his goods, and before he can place them on the market, demoralizes the industry and causes vexatious annoyances, sometimes actual confiscation. Brandy is no sooner in bond than the owner is looking for a purchaser, fearing as he does the danger of being caught at the end of the bonded term with unsold property. The present law would only be just in case the Government should assume the

cost of manufacture when it forces spirits upon the market. The injustice of enforcing a confiscation tax on property which the owner does not offer for sale or consumption is so apparent that no unprejudiced citizen can sustain the policy. The greater part of the evils of intemperance is attributable to the action of the Government. In England, recently, a reform has been agitated by friends of temperance on the principle of prohibiting the sale for consumption of any spirits under three years of age. In this country producers are compelled by the Government to sell within that time or to submit to a forced loan of an amount greater than the cost of production.

The policy of enforcing high licenses and oppressing retailers by bell punch taxes and the like drains upon their revenue, which at the same time permit unrestricted competition, operates to reduce the quality of goods sold to the consumer. There would be great wisdom in municipal regulations, based on careful calculations of the custom necessary to sustain retailers, by which the number of saloons should be limited according to the ascertained consumption at such places in each community, so that excessive competition and taxes should not force the sale of the cheapest and most inferior goods. Supplementary to such regulations the people have an undoubted right to demand strict supervision to prevent imposition. In fact, if spirits should be treated by the law as products which should not be sold in places of convivial entertainment, where the necessary caution in selecting and consuming is often impracticable by reason of the social conditions surrounding the act, but which should be limited to places where no consumption is permitted on the premises, or on any other where the trade in spirits is interested in the profits, the wine and brandy producers would have no just cause for complaint. If the sale of spirits is properly regulated the producers would have just cause to complain against discriminations and unjust taxation and oppression, both in their own behalf and for the protection of consumers.

Present efforts of those who aim to diminish the occasional evils of intemperance are conducted on the principle that the many who are innocent shall wear straight jackets in order that the foolish few may be restrained. The innate disposition for the preservation of personal liberty compels the many to assume in part the attitude of defending intemperance. Wise regulations for the prevention of alcoholic abuses, without interfering with the personal liberty of those who require no legal restraints, would meet with the cordial support of the great majority of viticulturists. These latter would not be so foolish as to anticipate any millenium, nor to imagine that criminal indulgences would be much less marked in the general average of the people than they are now in the ranks of total abstainers. No real progress can be made in reforming intemperate habits without curing intemperance itself, which is a habit of undisciplined mind, rather than any particular method of exposing the same. The so called intemperance, by which word is usually meant abuse of alcoholic drinks, is only one phase of intemperate life; restraint of one means of self-indulgence does not cure the complaint. The abuse of alcoholic drinks indeed often is induced by disordered physical and nervous conditions of health, due either to overwork, periods of abstinence and poor nutrition, continued and irregular fasts of mind in respect to social intercourse, sedentary occupations in badly ventilated apartments, with long fasts between morning and

evening meals, and their attendant consequences—torpidity of natural appetite, low spirits, headaches and biliousness, enforced idleness for active minds, and unrestrained criminal desires. The evils in these cases lie deeper than in the occasional or habitual abuse of alcoholic stimulants; and the habit of drinking sound dry wines at meals would cure most of these, or alleviate the misfortunes that arise from unequal burdens of life. In many cases an uncontrollable tendency to alcoholic excesses might be cured by the administration of a dose of calomel and quinine, followed by the free use of claret and water at meals and repetition of the anti-bilious treatment as the tendency to intemperance recurs.

It is to the physicians and scientific students of life, who do not expect any millenium, that society should look for the reform of alcoholic abuses; and to the wholesome restraints and discipline of youth in homes that permanent progress in social growth and healthfulness must be traced.

As to criminal acts committed during alcoholic excesses, we may assume that intemperance is the result of criminal conditions of the mind, which sets no restraints upon ambition and desire. As to insanity, who can tell whether it is not the insane disposition that leads to alcoholism?

A society for the promotion of temperance from truly scientific standpoints, and free from the intemperate desire to use political power contrary to the best interests of the development of individual character, should be organized in this country. No better model for study could be found than the society which now flourishes in France, while much might be added to its scope in the way of disseminating public information, and reviving parental control and discipline.

Our industry is forced to a consideration of these questions, not only in self-defense against erratic and impractical reformers, but also because our success largely depends upon the general good and prosperity of the people.

THE QUESTION OF OVER-PRODUCTION.

As to the prospect of over-production, in order to arrive at any satisfactory conclusion, we must first attempt to understand our markets, both for the present and the future, and also make some estimate of the friendly disposition of the mercantile classes through whom we need to reach consumers.

In respect to wine consumption, having determined the question as to the practicability of producing all that may be demanded of good quality at reasonable prices to the consumer, after adding the ordinary shipping profit of the general dealers, transportation, commissions, and the fair profits of the retailers, we have first to consider the capacity of our home markets within the United States for disposing of our goods. Out of our present population of fifty millions of people, certainly not less than thirty millions are without prejudice against the temperate use of wine. These constitute, besides those who would habitually use wine at the table if they could obtain it of satisfactory quality at reasonable prices, the greater number of those who occasionally or habitually use beer or spirits, or who have acquired the taste without the habit of wine consumption. Of this number there must be at least ten millions who well understand the use of wine, but whose habits have been changed or perverted by the im-

practicability of supplying their wants economically and with assurance as to uniform quality.

Assuming that we produce the necessary grades for commerce, and that trade is regulated so as to protect the consumer against imposition, ten millions of people, consuming annually thirty gallons of wine *per capita*, which is less than the average in France including all districts, would require an annual supply of three hundred million gallons. It may be considered certain that, with a well regulated commerce, long before this supply can be provided for by the growth of our vineyards, at least that number will have been educated to resume civilized habits of life. I will leave it to conjecture as to what effect on the demand the rest of the population will create. The growth of the country will certainly count for a great deal, and if our producers will study the peculiar palates of the American people, they may look forward to the time when the viticultural industries of California may successfully produce for home consumption not less than one thousand million gallons of wine.

How many temporary disappointments they may encounter, owing to imperfect mercantile resources, dishonest trading, and their own lack of facilities for holding their vintages in their own cellars until trade demands more supplies, it is difficult to predict. I have refused to take into account, when questioned as to over-production, any probable temporary derangements of trade, which will affect the sale of wines for short periods; such difficulties attend upon the development of all new industries, and it is the part of wisdom to foresee and provide against them. This year there are a few sections of the State, where new crops are offered at extraordinarily low prices; the cause is not that production is overdone, but that production is not complete. There is a want in such places of wine makers to purchase grapes, and the cost of transportation to other districts is great. The defect in the industry in such cases is in the minds of the planters, who should not have been encouraged to plant vineyards without contemplating also the manufacture of their own wines. Their necessities will bring about the proper remedies; if a few suffer from delay in realizing expected profits, their misfortune will not prove the failure of the industry.

The great majority of vine planters should intend to manufacture their own products. A few, exceptionally situated, may rely on the sale of grapes. This principle does not, as many suppose, apply only to the large producers, but more particularly to the small proprietors of twenty, thirty, and forty acres. In the latter case the vine-grower is less able to sacrifice a part of the profits of his industry than the owner of many acres, who may be satisfied with a small rate of revenue per acre to cover the interest on his investment. As a rule, the best wines will come from the small vineyards. We should have no one, as the planter of a wine vineyard, who has not the intelligence to make good wine.

It is not to the interest of viticulture that any conflict should spring up between the grape producer and the wine maker, as there must inevitably be if the two occupations are divided. The former will always lean towards the cultivation of varieties that give the least trouble and yield the largest crops; the latter will always endeavor to purchase the best quality for wine making at the least possible advance above average prices. The wine maker should

control the time of picking fruit, and the proper proportions to be delivered at one time for fermentation. He cannot practically do this when he buys the crop of another. The grape producer, who sells his crop, throws the risks upon the manufacturer, who in turn attempts to shield himself by extra margins for profit. Moreover, the wine crop, when largely increased, can be more easily carried until matured, or until demanded for trade, by distributing it throughout a large number of small cellars, supported by the individual credits and capital of many people, than by concentrating it in the hands of a few. In other words, the producers cannot afford, while increasing their crops, to force all the risks upon a few capitalists. A multiplication of wineries and cellars for maturing wine will give stability to prices, and avoid unnecessarily glutting at shipping points.

While the leading merchants are engaged in opening new markets and perfecting their facilities for distribution, the producers should not expect them also to furnish all the capital necessary for the storage and care of new wines. As much as possible, wines should be matured and stored where they are made, and the vine-growers should be the wine makers. Stable prices will depend largely upon these principles, and it would be well if all future planting should be governed by them. The profits of viticulture are endangered more by the competition of incomplete and carelessly planted vineyards than by the prospect of over-production.

High retail prices, false labels, and the refusal of hotels and restaurants to place wine in the same category, with respect to their profits, as tea, coffee, and milk, are great obstacles lying between the producer and consumer; concerted efforts must be made without delay to overcome them. The producers must act in this matter, harmoniously, if possible, with the merchants. In large cities, the practice of furnishing wine at the family door, collecting and refilling empty packages and bottles, and instructing the people in the simple management of small stocks obtained in casks, should be inaugurated more extensively than is now known. The people, by means of circulars and advertisements and through the news columns of friendly newspapers, should be constantly advised as to the prices for which they can obtain good sound wine. They should be taught everywhere and repeatedly that wine at sixty cents per gallon, when bottled, represents a cost of only twelve cents per full bottle and six cents for a half, or so called pint; that bottles should not be reckoned in the cost by hotels and restaurants any more than tea and coffee cups, water pitchers and glasses; that the caterer who does not know enough to buy wine in barrels and to do his own bottling, wasting neither bottles nor corks, should send for a wine dealer to teach him; and that all pretensions of drinking celebrated brands in public houses, except on extraordinary occasions, should be considered proof of ignorant affectation and folly.

The hotel keeper who does not entertain his wine drinking guests as liberally as he does those who prefer tea, coffee, or milk at their meals, should be fought as an enemy of the vine-grower. The guest who pays a fixed price for his meal should not be forced to drink tea if he prefers wine. The railway traveler has a right to demand six cents worth of wine—a pint bottle of good claret—with his fifty cent or seventy-five cent dinner. There is no hotel or restaurant in California that cannot afford to furnish a pint of good claret in place

of or at the same price as a cup of tea or coffee. The only excuse that can be given by the proprietors of such houses for ill treating the best class of guests that they entertain is, that placing wine on the table and making known that it is really cheap and satisfies the natural desire for stimulus, as well as provides the fruit acids required by the digestion, would interfere with the profits and popularity of the bar-room. If the many appeals that have been made to them to offer equal fare, according to the preference of guests, do not soon prevail, the vine-growers and their friends might seriously contemplate such a reform of public hostelries as shall prevent them from being conducted in the interest of the bar trade; it might possibly be questioned whether the two institutions should be licensed under one control.

This question of hotel fare is of more importance than that of merely securing hotel trade. At the hotel many people are educated in their habits of life while young, unmarried, or traveling. It is there that snobbish notions of fancy brands, and the idea that wine is an expensive luxury, are acquired; and it is there that temperate habits of wine drinking at meals, instead of bar-room tippling, might be formed. If the hotels and restaurants were the true friends of viticulture, the prospects of our industry and of civilizing the habits of the country, would be vastly increased. Their coöperation is a prize worth winning, and the way to do it is for the vine-growers of each section to make their influence felt where they spend their money.

When consumers are taught that a good, sound, pure, ordinary claret, a *vin ordinaire*, without fancy label, or capsule, is good enough for the every-day drink of any gentleman, and that a selected wine of superior quality, a *vin supérieure*, also without fancy name, is good enough for a Christmas dinner, they may think that they really know as much about wine as the experienced French epicures, whom they imagine they have been imitating, when they order their *St. Julien* and their *Chateau La Rose*. When they learn that their present stupidity and monkeyish epicurianism cause them to pay the landlord more profit on a bottle of wine than they do on a whole day's regular board and lodging, they will probably unite with us and make their influence also felt where they spend their money.

There will, doubtless, be a chance to begin soon to open a trade in certain grades of wines and brandy in London, Holland, St. Petersburg, and the seaports of South America. Our chances of competition will, probably, be best in the line of the best Rieslings, Sauternes, heavy colored clarets, port, sweet white wines, and brandy. France will probably restore her vineyards before we have much that her trade may demand. If not, we may sell to Bordeaux such blends as we can make with *Grosser Blauer*, *Mataro*, *Zinfandel*, and *Malbeck*. Our British cousins may be assured that our *Trousseau* (*Bastardo*) ports will meet with favor with even the Queen's wine merchant; but they must wait until our vines are a little older, which will not be long; and we know now that they will soon have an opportunity to harmonize their ideas with us, concerning the Panama Canal, over as good a bottle of pale brandy as their commercial hospitality to the good things of the world deserves. Their merchants, who establish their purchasing agents in Reims, Cognac, Bordeaux, Oporto, Xeres, and Madeira, will know how to make the best selections here, when the proper time arrives. Viticulture in

California would welcome the arrival of representatives of the British wine trade, for they are in all foreign countries the best supporters of the honor of the industry, and respected as gentlemen at home.

SHIPPING GRAPES AND RAISINS.

The progress made in the cultivation of varieties of grapes for table use, and for curing into raisins, has been most satisfactory. As compared with wine production, these branches of our industry are relatively small; yet they already give employment to a large number of families and forwarding houses.

The popular taste for fruit is, however, not very critical at the present time, except as to appearances. The most delicately flavored grapes are not yet the most in demand. Even for the local markets large showy bunches produced on rich soils are the favorites. There are a few exceptions, but not enough to cause the planters to cater extensively in that direction. Crisp, slightly acid, little flavored, large, firm, and brightly colored berries, set in large clusters, represent one type of favorites; pronounced muscat aroma and the foxy taste of the *Isabella* represent another; while for home use, the quality and dark skin of the *Black Prince*, or *Rose of Peru*, and *Black Malvasia* attract those who seem to appreciate that fruit is both food and luxury.

For eastern markets, good keepers and handsome clusters, with rosy, amber, and greenish colors, are sought with great energy by forwarding houses. The popular varieties for this trade are now *Moscatel* (the Malaga raisin variety), *Flame Tokay*, *Cornichon*, *Black Ferrar*, and *Emperor*. No doubt there are many other suitable varieties which should be propagated to add attraction to the eastern fruit stands. The growers would do well to study them with this object in view. The illustrations of the *Vignoble*, which may be seen at the office of this Commission, and such collections as those of Mr. H. W. Crabb, at Oakville, Napa County, would aid in suggesting experimental cultures. This branch of viticulture can be extended as rapidly as the markets show continued demands, our resources being practically unlimited. For such purposes rich soils should be selected and care should be taken to avoid all irrigation that is not necessary to maintain the vigor of the vine. The general experience of the State tends to show that the fruit of vines, irrigated in Summer, is not as durable as that from unirrigated land. This rule may find, possibly, some exceptions in places where hot dry Summer winds assist the sap in evaporating its aqueous excess and in elaborating fruit acids and sugar.

Rapid transportation by rail has been provided for the forwarding trade, and it is to be hoped that lower freight rates may yet be granted. The producers, I believe, can perfect arrangements for preserving large quantities of certain varieties of grapes until Winter, when they would bring more profitable prices and prolong the markets. I am so convinced that this can be done that I intend to make some experiments this year.

The raisin industry received its first popular impulse from the attention that was attracted to the products of Mr. R. B. Blowers and Mr. G. G. Briggs, of Yolo County. The California Raisin Company ventured largely upon it in Placer County, and Riverside led off in the example for the young colonies of the southern part of the State.

The *Moscatel*, imported by Colonel Haraszthy, is the variety that makes the true Malaga raisin and has been largely propagated under various names. No doubt there are some differences owing to other importations from nurseries in eastern States and Europe where the *Moscatel* has always found a place and where there are often associated with it the English seedling stocks. Concerning these differences confusion prevails, owing to the varying circumstances under which they are grown.

Inferior raisins have been made from the *Flame Tokay*, *White Malaga*(?), *Fehér Szagos*, etc., but these should be discouraged. We cannot compete against Malaga raisins with any other than the *Moscatel*.

Many thousand acres of raisin grapes have been planted, but as the *Moscatel* repeats in California, more or less, its European history, it is probable that before long our experience will cause its culture to be restricted to certain districts most favorable to its growth and fruitfulness. That the range of country is much larger here than in Spain for raisin culture is very certain, and results have demonstrated that with care in curing and packing, California can soon, if permitted to enjoy the same protection that is given to eastern industries, supply all that the markets of the Nation demand of as good average quality as the products of Spain.

Raisin and table grape culture will work harmoniously with the wine industry, relieving the latter of many tons of fruit that are unsuited to the wine press, and sending their surplus and inferior culls to the distilleries. The stocks planted for any viticultural purpose will, from time to time, as circumstances and experience guide the owner, interchange their original destinies by means of grafting. Many *Moscatels* and table varieties will be grafted to wine grapes and *vice versa*.

The late crops of raisin grapes, which are worthless for the curing processes, or for shipping east, may be made into wholesome light dry wine for the families and workmen who do not prefer to purchase more tonic clarets. It would be advisable for the growers to plant a small area in *Mataro*, *Grosser Blauer*, and *Burger*, to mix with their refuse *Moscatels*, so as to provide a more refreshing and acceptable wine which, while not of the finest class, would be quite palatable to all who understand its origin and purity.

The *Sultana*, a seedless variety, succeeds more widely than the *Moscatel*. To what extent it will become popular will depend upon the demand of the market for Sultana raisins.

The *Corinths*, which make the currants of commerce, are being experimented with in many places with varying results. They will probably become restricted to a very few districts.

The Committee on Raisins, having in charge the preparation of the appeal of the industry for proper protection by Congress, will no doubt make a careful statement of all necessary details, which will be made public; therefore I shall not attempt to duplicate or forestall their work.

I have given special study this year to all questions that I could discover bearing upon the culture of the *Moscatel*, with a view, if possible, to indicating methods of preserving its fruitfulness in many places where it now appears to fail often. I shall reserve the discussion of the subject, however, for the proper places under the heads of pruning and ampelography.

PART III.

CULTURE OF THE VINE IN CALIFORNIA.

COMPRISING NOTES OF STUDY AND OBSERVATION, MOSTLY INVOLVING GENERAL PRINCIPLES, WHICH WHEN APPLIED WITH KNOWLEDGE OF LOCAL CIRCUMSTANCES AND CONDITIONS, MAY SERVE AS INSTRUCTIVE GUIDES FOR FURTHER INVESTIGATION, EXPERIMENT, AND PRACTICAL EXPERIENCE.

EXTENT OF POSSIBLE VITICULTURE IN CALIFORNIA.—Climatic conditions are practically the tests of possible areas of arable land for viticulture in California. In a few cases the chemical constituents and physical conditions of soils, and the impossibility of obtaining water for irrigation in a few others, may prevent the growth and fruitfulness of the vine, where the climate is otherwise favorable. The vine flourishes and bears fruit, as Guyot says of France, in all geological formations; in the lightest sandy loams, heaviest black adobes, gravelly clays, and loams of all shades of color known to the farmer, granitic, volcanic, calcareous, silicious, sedimentary, alluvial, etc. Given correct climatic circumstances, the physical conditions to be ascertained in determining a home for the vine are good drainage, especially of the subsoil, elevation above the line of severe late Spring and early Fall frosts, a surface soil sufficiently retentive of moisture which involves the question of depth and nature of subsoil, as well as of chemical composition; and, where irrigation is not practiced, either a deep friable, or penetrable subsoil, or rock stratum capable of maintaining a reserve supply of moisture, or such relations between soil, subsoils, and permanent surface water, not too near the top, as shall maintain moisture with proper cultivation by means of capillary attraction. Very shallow soils, overlying substrata of clay, rock, etc., impervious to roots, and especially on flat lands, where drainage is thereby impeded, are most unfavorable to the growth of the vine, and rich alluvions with permanent water near the surface, are most destructive of fruitfulness and the proper ripening of fruit and new wood. The few exceptions of soils, with respect to chemical constituents, are mainly comprised among those that are alkaline, or poisoned by the decomposition of certain roots and soured by want of proper aeration and drainage.

The essential climatic conditions consist in a maintenance of a certain regular annual range of heat, together with a comparatively dry atmosphere, especially during the period of vegetation. Constant atmospheric humidity, whether from rains and conditions preceding them, or from fogs, is fatal to viticulture. Either the rainfall must be sufficient to supply loss of moisture in the soil, or there must be conditions to supply the same without fail in all seasons by capillary

attraction, or seepage from watersheds, or the deficit must be provided for by artificial irrigation. The essential quality of the climate of California, which extends the limits of viticultural areas, is the aridity of the Summer atmosphere combined with equable temperature and mild Winters. Where sufficient moisture is maintained in the soil, the more arid the atmosphere within the viticultural zone, and the more equable the temperature, the broader are the viticultural opportunities and the more varied the resources.

These principles being understood, any practical observer may select within the territory of California a site where the vine may be made to flourish with proper cultivation. The area of possible viticulture, tested by no other rules, will be found to comprise at least two thirds of the arable land, or many million acres. The resources of the State with respect to viticultural area, are practically exhaustless—vastly more than those of France. It is our dry Summer and broad latitude for the vine that gives this State an advantage over all other countries of the world.

SELECT LOCATIONS FOR VITICULTURE.—Experience has shown that, with reference to quality of products, certain soils, chemically and physically considered, under peculiarly favorable climatic influences, produce the best results. In this respect, also, the variety of vine and the purpose for which it is cultivated, further restrict the selection of the best locations. For certain results the area for successful cultivation of some varieties is comparatively very limited, while it may be very extended for others. Different varieties of vines have certain prescribed homes, and within their limits their qualities may so vary that for certain uses their limits of cultivation must be very carefully restricted.

Peculiar qualities of certain varieties of grapes control certain corresponding qualities, or characteristics of the products, whether considered in the state of nature, or changed by industry into raisins, wine, brandy, etc. Conditions of soil and climate may modify these characteristics; but in all cases of products of superior quality the first essential element of success tending towards any desired result is the proper selection and adaptation to soil and climate of the appropriate variety or varieties of vines.

Therefore, in considering what are select locations for vineyards within a broad viticultural area, we must determine several questions:

First—The varieties of vines that will prosper in a given place.

Second—The various possible products that may be obtained from either one or more of such varieties.

Third—Which of such products are of superior value.

Following this method of determining the areas for select locations, the greatest possible achievements may be estimated. Generally, however, careful vine planters have in view some particular type of products which they prefer to produce, and are already owners of the land to be planted. In this case they may have a select location for wine grapes but prefer to cultivate table or raisin varieties; or they may have a fine site for raisin production and prefer to produce a wine of Burgundy type; or they may have a choice place for fine Burgundy and prefer to make sweet ports or sherry. In such cases they might fail altogether to produce what they desire, or only approximate the same from the commercial standpoint, while at the

same time they have sacrificed the true value of an otherwise select location and diminished the viticultural reputation of the State.

Others may desire to purchase land for the cultivation of varieties for certain products, but may select places unsuited to their purposes. These, besides depriving the State of the advantages of their good intentions, well directed, add to the mistakes of the preceding, in increasing the production of inferior goods, and still further injure the prospects of commerce.

Others, also, ignoring that there are qualities of superiority inherent in different varieties, may, as many have done, estimate the value of what they select to plant by the sole test of quantity, and trust to the trade to find use for their crops. This class cannot, with very few exceptions, avoid falling into errors that degrade quality, and tend to defeat the ends of commerce by disappointing or disgusting consumers.

Admitting that viticulture might fall into all these errors, part unintentionally, part heedlessly, the result would be that practically there would be no choice vineyard locations, and competition with viticulture of other countries, governed by experience and intelligence, would be impossible in all except the line of inferior goods.

Another possibility is worth reflection. Admitting that there are within the State many millions of acres on which viticulture may thrive, of which only a part is suited to produce the finest results, and that the demand for our products will not justify the cultivation of more than a comparatively small portion of the entire area in vines, it might happen that the lands selected for vineyards will all, or nearly all, be of inferior quality. In that case, from a brilliant possibility viticulture would descend to the level of an unpromising fact.

It is scarcely worth while saying that in the event of the selection in all cases of the most favorable locations and of their devotion to the types of products possible of attainment in the highest degree of perfection, care being taken, where choice is practicable, to avoid over-production in those directions where markets are most limited, viticulture would achieve its most brilliant successes, danger of over-production would be practically avoided, profits of producers would be insured, and commerce would be facilitated by the popularity of products.

Having reflected on these possibilities, viticulturists will find it easy to draw the following conclusions without danger of being considered partisan or prejudiced:

First—That only a portion of the possible viticultural area of California can within this generation be profitably cultivated in vines.

Second—That for certain desired products only comparatively limited areas have special advantages for the production of superior quality, and in some cases, where quality can be assured, there are economical differences as to facilities for transportation and labor supply.

Third—That products of superior quality will command the best prices and readiest sale, as compared with inferior goods of the same types.

Fourth—That so long as profitable prices are paid for goods of superior quality, the progress of plantation in districts, where they may be produced, will probably continue.

Fifth—That whenever over-production occurs, inferior products

will be rejected by commerce, unless ruinous competition has made production of the finest articles unprofitable, in which case, all will suffer to some extent.

Sixth—That owing to the possibility of over-production of inferior goods, it is the part of wisdom to counsel planters to strive to produce those types of commercial value which will find the readiest markets and for which their lands and facilities are best adapted.

To accomplish these desirable results, those who own land which they desire to plant, should abandon all prejudices as to preferred products, which they have least chances of attaining, and either abandon viticulture or devote their resources to their best probable advantages. And those who desire to purchase lands for the purpose of engaging in the production of certain preferred types, should be careful to select locations most favorable to the culture desired, facilities for transportation and labor, as well as soil and climate, being considered.

THE CHEMICAL CONSTITUENTS OF SOILS.—It is too early in the history of viticulture in California to pretend to classify the soils best adapted for the production of the finest results from the standpoint of chemical analysis. No general rule for close application can be deduced from the experience of other countries, and our own experience is yet too limited. Chemistry does not even reveal the secrets which control the marked difference of quality between the wines of many neighboring vineyards in the old world, where the question of cause has long been mooted.

The planter should dismiss entirely from his mind, so far as he is controlled by practical desires, the notion of attaining to the distinction of remarkably fine and locally celebrated wines. His practical aim may be to produce a type of fine average excellence within a given district of general average conditions. The happy selection of a spot destined to be celebrated may partly be due to his own careful study of analogies, but will be mainly due, with respect to other apparently equally fine localities, a matter of chance. Careful selection may bring him within the charmed circle of lottery prizes, but his may not prove the highest on the list.

It is more than probable that the chemical constituents of soils have less to do in causing the fine distinctions that are noticeable to connoisseurs in wines of neighboring growth, than the varying physical conditions, such as depth, drainage, elevation, shelter from or exposure to certain atmospheric influences, pre-organic history of the humus and vegetable mold, and slightly varying proportions and sporting developments of the varieties of vines cultivated.

Chemistry, together with careful observation of the physical conditions of soils and local climatic conditions, may indicate the general features of a wine district capable of producing a general average result, similar to some desired local average product. For instance, there is sufficient common resemblance within each class of the local wines of the Médoc, Sauterne, Burgundy, Xeres, the Rhine, the Champagne district, Roussillon, and the brandies of Cognac, notwithstanding the fine distinctions drawn between those of different vineyards, to constitute what we may call local district types. In the attempt to reproduce, or approximate, or rival any one of them, we may derive some advantage from the chemical analysis of soils.

However, the exact counterpart of the soil of Johannisberg on the Rhine, with the same varieties of vines would assuredly fail to produce the same fine results in the climate of Nice or Roussillon. Hence the first consideration must always be that of climatic influences and physical conditions. Then chemistry may lead to approximate conclusions. Chemistry could not find a vineyard on the Rhine, nor in Napa County, of this State, for the production of Malaga raisins. How far climate will influence the production of desired types, where soil is satisfactory, and the varieties of vines are properly selected, experience only can prove. I have proceeded, in giving advice as to the selection of types, on the theory that the history of any given variety of vine in other countries will reveal the surest and safest guides to follow; and I have always advised planters to follow those indications of success, which are comprised within the greatest number of points of resemblance to their own localities, and those of regions where certain varieties have become popular in other countries. Thus I find the celebrated *Moscatels*, *Corinths*, *Cabernets*, *Pinots*, and *Rieslings*, very restricted in European culture. Some experience in this State with the same varieties tends to demonstrate the same destiny as possible for them here; and I find that the general rules governing their restriction, both here and in Europe, so far as any experience is recorded, point to certain climatic influences and physical conditions of soil as the true secrets of success and failure, rather than to noticeable differences revealed by chemistry. Certain other observations, with reference to certain types of wine, reveal less importance in the study of varieties, and more in the study of chemistry and climate. This is applicable, particularly, to sherries and ports, although in them, also, variety of vine rules the quality, though a given variety may not be as necessary to produce the commercial type.

I shall not pursue these observations any further, having outlined sufficiently the general principles that should govern the selection of locations with reference to certain desired results, recognizing the relative importance of different means to that end.

SOILS AND PHYSICAL CONDITIONS CHARACTERIZING SOME OF THE CELEBRATED VINEYARD DISTRICTS OF THE OLD WORLD.—For the sake of comparison and general information, I will give descriptions of the soils and physical characteristics of some of the vineyards of the old world, where celebrated commercial types are produced.

Burgundy.—The Department of Côte d'Or, France, comprises the true Burgundy district, although commercial Burgundy types embrace also wines from neighboring districts, more or less blended with heavy wines from the Mediterranean coast. The celebrated vineyards of Volnay, Pommard, Clos de Vougeot, Chambertin, etc., are in the Côte d'Or.

The fine wines come from the slopes of the rolling, calcareous, oölitic hills, surrounded by tertiary alluvion, and overlying calcareous gravelly, marly, and sandy alluvial subsoils. The ordinary wines come from the surrounding alluvions. The following are analyses of the soils of three of the important vineyards:

SOIL CONTENTS.	Montrachet.	Romanée-Conti.	Chambertin.
Alkaline salts	0.973	1.034	0.931
Carbonate of lime	1.752	7.934	2.127
Magnesia	0.821	0.987	2.298
Oxide of iron	9.349	7.392	2.961
Phosphoric acid	0.321	0.257	0.235
Alumina	3.672	3.476	2.063
Soluble silica	0.567	0.871	0.110
Organic matters	2.034	2.785	1.973
Insoluble residue	80.511	75.264	87.302
Totals	100.00	100.00	100.00

Analysis of the matters contained in the rocks show from 55 to 96 per cent of carbonate of lime, magnesia and iron in small proportions.

Some similarity in appearance and geological formation may be traced between the hills and slopes about the mouth of the Arroyo del Valle, near Livermore, in this State, and those of the Côte d'Or; the climatic conditions are, however, different, for in Burgundy, only very hardy vines can be cultivated, and late ripening grapes could not be matured. Rain also falls in the Summer there, while cloudless skies prevail over the Livermore Valley. Experiments, however, with vines in my own vineyard show great vigor and disposition to fertility with Burgundy stocks; the future will test the quality of the wine.

The Champagne Country.—The Department of the Marne, including the famous champagne vineyards, lies east of Paris, and on the northern limit of viticulture. Only early ripening and hardy varieties can be grown there, and it is difficult to get wine stronger than ten to ten and a half per cent of alcohol, even with the Pinot varieties, which are cultivated. Fermentation is checked by the cold weather, and resumes the next Spring. Efforts to keep new wines in bottle caused the invention and perfection of sparkling wine.

The surface soil is shallow; the subsoil is calcareous and chalky. Analysis of the subsoil shows carbonate of lime, 80; carbonate of magnesia, 2; clay, or silica, 18. Analysis of surface soil at Ay, shows, alkaline salts, 0.985; carbonate of lime, 28.862; magnesia, 1.401; oxide of iron, 4.545; phosphoric acid, 0.147; alumina, 0.849; soluble silica, 0.095; organic matters, 3.750; insoluble residue, 59.366.

Côte-Rotie.—The wines of Côte-Rotie are produced in the Department of Côtes du Rhone, from granitic slopes, with southwest exposure. The climate is comparatively arid, resembling that of Southern California in many respects. The varieties cultivated are the *Sérine* (now recognized to be the *Petite-Syrah*), a red wine stock, and *Viognier* (white).

Analysis of soil shows: Alkaline salts, 0.940; carbonate of lime, 1.384; magnesia, 0.497; oxide of iron, 10.00; phosphoric acid, 0.259; alumina, 2.326; soluble silica, 0.940; organic matter, 6.551; insoluble residue, 77.103.

Hermitage.—The Hermitage wines, from the same department as the preceding, are made from the same red wine variety (*Petite-Syrah*),

blended with *Roussanne* (white) principally. The soil analyses show essentially the same characteristics as that of Côte Rotie, with the difference of the carbonate of lime, which is in greater proportions, viz.: 2.65 in portions where minimum quality is produced; 35.52 where medium quality grows; 5.56 where the best wine is recognized. 10.161 of iron characterizes the soil of lowest grade; 3.53 that of medium; 4.04 that of the best. The best grade shows the largest percentages of organic matter and phosphoric acid.

Such comparative analyses as are made of different parts of the Hermitage soils demonstrate that the secrets of fine distinctions cannot be traced by the chemist. Hermitage soils are all granitic, as the soils of the Cajon Valley are in this State, and appear to vary by the admixture, more or less, of loose granitic debris, with a kind of red pastry granitic alluvium, similar to the subsoil of the Cajon. As these proportions vary, as explained to the eye and not to the test tube, the quality of wine varies. An acre of the so called granitic part of the Hermitage is valued at from \$2,500 to \$3,500; while that which has more mixture of the soil formations is worth almost double.

Frontignan.—The famous Frontignan Muscat wines were made from the *Muscat blanc* variety, known here as *Frontignan*, in the south of France, near the Mediterranean. Soil calcareous, mixed with oxide of iron and washed gravel; percentage of carbonate of lime, 42.85; alkaline salts, 0.57; magnesia, 0.10; oxide of iron, 2.25; phosphoric acid, 0.13; organic matters, 6.50; alumina, 1.49; soluble silica, 0.30; insoluble matter, 45.81.

The Lunel Muscats came from gravelly calcareous clay in the same district.

Roussillon.—The wines known as Roussillons in trade come from the Mediterranean coast of France, towards the Spanish border. The varieties are *Mataro*, *Carignan*, and *Grenache*, *Mataro* predominating. The general characteristic of the country is granitic schist, yellowish and reddish. The greater part of the best vineyards is on steep hillsides, where the soil is supported by terraces. Analysis of soil at Banyuls-sur-mer shows, alkaline salts, 1.235; carbonate of lime, 0.909; magnesia, 0.882; oxide of iron, 10.746; phosphoric acid, 0.109; alumina, 5.02; soluble silica, 0.963; organic matters, 4.478; insoluble residue, 75.658.

Other analyses show practically the same results. This is a country for fine sweet wines as well as heavy dull reds.

Madiran.—The Madiran wines, valued in Paris for their firmness for blends, their tannin and color, owe their main properties to the *Tannat*, which I procured for this State through Mr. Stanislas Baron, of Paris, three years ago. It is now sustaining its French record for tannin by actual experiment here. It produces its valued product at Madiran, in the upper Pyrenees, on an alluvial deposit, mixed with clay and silicious sand from the mountains, with an abundance of washed gravel, with some calcareous matter and marly subsoil.

The Landes.—Wines of good quality are produced in the Department of Landes, south of Bordeaux, on the Atlantic, near Spain. At Cape Breton, vines are cultivated on the east slopes of the sand

dunes along the seacoast. These sand dunes are similar in aspect to those along the coast near San Francisco. Analysis shows 98.80 of silicious sand and 1.20 of fragments of shells, formed of carbonate of lime. Traces of sea salt are found by washing the sand. The vines are protected against the moving sands and the sea breezes by palisades. Spaces about the vineyards are left, where sand is obtained to renew the soils (?) with new elements. These vineyards are known to have existed as far back as the middle of the fifteenth century.

It is difficult to find any comfort from the analysis of the Cape Breton soils.

Bordeaux.—Bordeaux wines may be classified as those coming from rich alluvial bottom lands along the Gironde, Garonne, and Dordogne, called *vins de Palus* (bottom land wines), and the *graves*, which come from gravelly, sandy loams, overlying sandy clay or a conglomerated ferruginous layer of impervious gravel, called *alios*. The claret vineyards of the Médoc are on gently undulating, gravelly slopes, with a general easterly inclination towards the Gironde, which is practically an arm of the sea. This narrow vine-bearing slope is limited on the west by sand dunes a few hundred feet high, the only shelter from the Atlantic breezes. The Médoc vineyards have salt water on both sides and the climate is decidedly fresh. I was compelled to wear an overcoat while I was there watching the vintage.

The analysis of the soil at Chateau Lafitte is as follows: smooth-washed quartz pebbles, 62.90; fine sand, 28.30; pure silica, 6.22; total silicious elements, 97.42; humus, 1.28; alumina, 0.754; lime, 0.04; oxide of iron, 0.086.

The soil at Chateau Margaux shows: potash and soda, 1.291; carbonate of lime, 0.891; magnesia, 0.263; oxide of iron, 3.341; phosphoric acid, 0.147; alumina, 1.59; soluble silica, 0.38; organic matter, 6.67; insoluble residue, 85.427.

At Chateau Yquem, further inland, alumina shows 4.675, making a firmer soil. In other respects the analysis is practically the same as at Chateau Margaux. Yquem produces the finest Sauterne; Margaux, one of the four highest graded clarets.

Nothing could be deduced from the comparison of soils of Margaux and Yquem as to the essential differences between soils for fine white and red wines. Margaux is, however, too near the sea to properly ripen Sauterne grapes, and it seems that the Médoc claret grapes produce their best results under the influence of salt sea breezes. Here, again, is an instance of the great importance of studying climatic influences. Moreover, it seems that fine clarets with certain varieties of vines may be looked for from light sandy soils in moist seacoast atmospheres, a good proportion of iron and potash being present.

Cognac.—The soil of the cognac brandy vineyards may be described as generally a light calcareous clay or sand, overlying chalk or oölitic deposits. The climate is unfavorable to the good maturity of wine grapes; the *Folle Blanche* produces well, but makes a wine that will not keep six months—from five to seven per cent in alcoholic strength. Cognac may be described as distilled from greenish wine, produced over chalk beds.

Cahors.—The wines of Cahors, valuable in blending Bordeaux clarets with light white wines, come from calcareous slopes on both sides of the river Lot; clay and sand are associated with the lime. The wine is finest where the sand predominates.

Alsace.—In Alsace the Zehnacker wines are produced on soils having 87.58 insoluble matter; 2.049 organic matter; 2.5 alumina; 4.65 oxide of iron; 1.34 of lime; 0.973 alkaline salts.

Spain.—The greater part of the vines of Xeres, San Lucar, and Trebugena—sherry varieties—are planted in *albarissa* soil, which contains sixty to seventy per cent of carbonate of lime, mixed with clay and a little sand and magnesia.

In Malaga, the vines are mostly on benches and steep hillsides; soil is slaty clay, traversed by quartz veins. D. Simon Roxas Clemente records that the wines of Malaga vary in quality inversely as to quantity, and that as soon as the bottom lands were irrigated and given over to other cultures, the vines ascended the unirrigated hills and quality of product was greatly improved.

Sicily.—The best and most durable Marsalla wines come from red gravelly soils. The porous rich soils yield stronger wine and greater quantity, but less agreeable to drink and frequently spoiling easily.

Germany.—Johannisberg wine is made from a southeasterly and southwesterly exposure on a hillside, with subsoil of clay schist mixed with gravel. The surface soil shows: humus, 2; carbonate of lime, 9; alumina, 12; silica, 73; organic debris, 3; magnesia and oxide of iron, traces.

Liebfraumilch shows: potash, 3.86; soda, 5.49; lime, 3.11; magnesia, 1.90; oxide of iron and manganese, 7.25; alumina, 8.30; silica, 67.90.

Deidesheim shows 94 per cent silica and no lime.

Madeira.—The best wines occupy the south slopes. The soils are generally rock, mixed with clay, sand, and marl, sometimes pure volcanic cinders, gray or black. The sandy and rocky soils bear the best vineyards.

WHAT DOES CHEMISTRY, AS APPLIED TO EXAMINATION OF SOILS, TEACH?—This question should have a practical bearing on the growth of viticulture in new countries. Disregarding those careful observations, which the practical man can make, with reference to comparative differences, as shown to the eye and touch, between physical conditions and local surrounding influences of climate, shelter, etc., chemical analysis reveals very little to guide the planter in selecting vineyard land, or in adapting certain varieties of vines for certain purposes. Science has determined that certain minerals and certain quantities of humus, or nitrogenous matter, are useful to sustain plant life. The analyses of soils, such as I have given in the preceding paragraphs, demonstrate that books can prescribe no general rules for the determination of the proportionate quantities of such matters necessary to constitute a soil for successful viticulture. It may be said, however, that it is shown conclusively that no soil, which any practical man is likely to select for a vineyard, can be condemned on the strength of any chemical analysis, unsupported by rules derived

from local experience. The soil, if it may be called a soil, at Cape Breton, cited above, shows how weak, in all appreciable quantities of mineral and organic fertilizing matters, a certain district may be, and yet, under certain climatic influences and physical conditions, give good results. Experience may show that under other influences such soil would be barren.

As to the fertility of land, the farmer may judge somewhat, in advance, by examination of the native grasses, shrubs, and trees; afterwards, he will find, by the growth and yield of his vines and by simple experiments, whether he requires more or less fertilizers. Science has well shown what kinds of fertilizers generally produce certain differences of results; but local experience shows that the proportions needed to maintain vigor of growth and fruitfulness will vary with conditions of climate and soil, irrespective of chemical constituents of the latter. If potash is wanted, science may indicate in what forms it may be obtained and most easily applied, and the relative commercial value of different samples. So with phosphoric acid and humus.

As to the influence of certain proportions of lime, iron, magnesia, silica, and alumina, chemical analyses of soils of one district reveal no rules for the selection of land in another. Compare the proportions of these matters in the three celebrated Burgundy vineyards given (Montrachet, Romanée-Conti, and Chambertin), and it will be seen that no rule can be applied, even for one district. The presence of carbonate of lime and oxide of iron is generally believed to operate favorably upon the quality of wines, both red and white; but the exception of the fine Médocs, with their low percentage of lime, and the varying distinctions between the soils of Johannisberg and Liebfraumilch, as to iron, show again that no certain conclusions have been reached for general application.

The variations in the soils of different parts of the Hermitage indicate no progressive changes in relative proportions of matters, as compared with progressive values of the land, except in the items of potash, magnesia (not very materially), and organic matter. In other respects the proportions vary wildly. Chemistry has in that case revealed only which is the most fertile land—that which probably appears to the eye of every observer, and probably accounts for the differences of value, as in all countries.

The close resemblances in the soils of Chateau Margaux and Chateau Yquem prove that chemistry cannot indicate the homes for certain varieties of vines, even in regions very close together, nor the peculiar advantages of any one for the production of red or white wines.

A good illustration of the difficulty of arriving at a conclusion as to possible quality of products by means of chemical tests of soils, when applied to different districts, is found in the following passage, which I translate from Professor Ladrey's chapter on the soil of vineyards:

In the Beaujolais, the wine of calcareous deposits is inferior in quality to that of the granitic, notwithstanding the almost absolute identity of climate and exposition. It has been thought possible to conclude from this that if the granitic deposits of Beaujolais had extended as far as the Côte-d'Or (Burgundy), all the other conditions remaining the same, the granitic soils would have produced there wines even superior to those now given on calcareous soils.

It has been asked, by analogous reasoning, but in another order of ideas, why, in spite of the great analogy in certain respects between these two districts, we do not find on the slopes of Beaujolais vintages of first class comparable with those which give reputation to the Côte-d'Or.

Professor Ladrey suggests certain differences as to the question of altitude that may account for this difficulty in research.

The truth is that chemical analysis of soils bears about the same relation to the determination of prospective viticultural achievements as the multiplication table does to astronomical science.

That the presence of a relatively large percentage of carbonate of lime in the soil, and especially in the subsoil, together with a fair percentage of magnesia and silica, and iron, characterizes generally fine vineyard districts, is apparent; but it is not so apparent that these matters exercise directly as much influence on the vine as do the physical conditions of soil in which such matters are usually found plentifully. I believe that it is more important to know that the subsoil, or under strata, are of a cretaceous, or tertiary class, permeable to roots, and thoroughly drained, than to ascertain the proportions of the various mineral constituents.

As one rule of quality in viticulture is that it is inversely proportionate to quantity of product, we know that while heavy clay soils, rich in humus, well drained, and provided with abundant moisture and heat, will produce heavy crops, and that while chemical analysis may determine some of these properties, practical experience would not class the land as first grade, except for the production of shipping grapes, in which the only quality desirable is appearance and durability, the latter requirement being attained only where the moisture is not excessive. Another rule of experience is that years of drought are years of excellent wines, indicating that atmospheric aridity and free evaporation of vegetable sap may modify the estimate of soil valuations. Comparatively light, warm, porous, well drained, rocky or gravelly soils, containing an abundance of mineral constituents from rock disintegration and comparatively a minimum of humus, and a fair supply of fresh moisture without dampness, are the leading characteristics of fine wine districts; but this relates to relative intrinsic quality rather than to the types of products, which appear to depend more on the climate and the varieties of vines cultivated.

Some of the mineral parts of the vine are interchangeable, the oxygen employed in compounding them for plant use being the same; thus the ashes of the same variety of vine from different places will show different proportions of lime, soda, potash, etc. These facts have given ardor to chemical research, and may justly cause students to hope for great discoveries in the future; at present, however, science has not been able to formulate its scattering knowledge of soils so as to be of much practical use. The impracticability of analyzing all the resources of the vine, and of determining the circumstances that govern it in making use of different minerals in different proportions, are the present obstacles to rapid progress. Perseverance may accomplish something in our times.

Monsieur C. Ladrey, Professor to the Faculty of Sciences of Dijon, France, has published the most interesting comments on the influence of the soil on the vine that I have read; I intend to translate them soon. He quotes M. de Gasparin, saying:

Other things being equal, we obtain grapes containing much sugar and little acid from a dry soil, more free acid from a moist soil, and much acid, albumen, and mucilage with little sugar, from a wet soil. The same savant has equally established that in neighboring soils, placed under similar conditions, the proportions of sugar and acid may be the same, although these lands may be of different chemical composition, but the qualities and values of the wines will

not be identical. It is often observed that, without changing in nature, a soil may become very suitable to the culture of the vine, when the slope or possible desiccation renders the humidity less. These considerations show us how much drainage may be useful in improving the soil of certain vineyards which are not favorable to the vine by reason of excessive humidity.

The geological student who will bring his examinations to bear on small sections of land, and unite his observations with those of the meteorologist and botanist, will do more to determine good vineyard soils than the chemist.

Chemical study will assist greatly in determining general theories of action, and in guiding the farmer in fertilizing and in assisting by natural processes fermentation and other phenomena that are practically under the control of man, but it will never set a price on land, nor deter the selections of locations where practical observation is more competent to decide.

I would, however, counsel the continuance of soil analysis over broad extents of territory, as a means to the adoption of sound general theories for the partial guidance of entire communities, and to further the cause of science, which finds unexpected uses for all knowledge; also, as a means for detection of hidden causes of known defects, which baffle the practical skill of the farmer, and for the suggestion of remedies.

We need now to institute careful geological, botanical, and meteorological surveys, both of cultivated and uncultivated land, with the economic object in view of ascertaining all the practical lessons that may be derived from plant life, both cultivated and in the state of nature, under given circumstances and conditions. Such a study would approximate towards the desired end of ascertaining the true value of land for certain uses in viticulture. In many cases chemistry would play a useful and important role in this work, but it would never be the leader of the expedition. It is in the arts under the control of man that the chemist may often lead, but experience with the popular vice of attempting to imitate, rather than to assist nature in all industries affecting our food supplies, should lead us to subordinate him to the devoted student of the phenomena of organic life. This principle should be the religion of the wine cellar.

In conclusion, I may truly say that I have derived most advantage, with respect to ascertaining approximate rules for the selection of soils and varieties of vines, by studying the climatology, geology, and geography of viticultural regions, together with the industrial history of varieties of vines within the range of experience covered by such studies; these advantages are supplemented by local experiments and the test of the palate and commercial favor. Where experience is at fault and in doubt, chemistry will hasten the solution of problems presented. Such is the valuable work now being inaugurated at the State University.

THE ROLE OF THE TASTER.—Chemistry, with reference to the production of good wine, considered not only in respect to the art of fermentation, but also to the selection of the vineyard, the vine and fertilization, may be viewed in about the same relation as it bears to the art of skillful cooking. Good cooks and caterers have achieved world-wide reputation by the use of natural faculties, which are more subtle in the detection of excellencies, and by experience, which has taught how to obtain and combine them, and how they affect human

health and pleasure. Economies in practice have been aided by chemistry, as applied to the arts of production of a few inorganic substances, and by mechanical appliances. Pure science has, however, added very little to the advantage of the human stomach, and has done little more for the producer of food supplies, than to facilitate economy in fertilizing, explain certain laws and rules of organic life, as applied to pruning of plants and the hygiene and diseases of animals, and the cheap preparation of certain matters manufactured as food ingredients, such as sugar, salt, saleratus, vinegar, yeast powders, etc. It has, indeed, developed plans for the preservation of food against parasitic life. The most of such advantage has, however, been derived from botanical, physiological, and biological studies. To chemistry we owe, to-day, nearly all the fraudulent conceptions which are framed to deceive the eye and the palate and to disappoint digestion. That chemistry has done more harm than good, so far as alimentation is concerned, needs little demonstration; the secrets that it has revealed have mainly been of benefit to the counterfeiter, because its true role has been mistaken in the matter of promoting life and its enjoyments. Chemistry may analyse and reconstruct, provided the life principle is not wanted in the product; but when the source of life is sought, it must play the part, with very small exceptions, of analyst alone, protecting man, beast, and plant from the ways of death. It may indicate the food of life in man, beast, plant, and ferment, but it cannot create it, and in its present condition of progress it is far behind the trained palate in detecting what is good and what is bad for food. The trained senses are yet worth more to protect the consumer than chemistry.

Science is, however, innocent of all crime; it is the errors of scientific students and their false pretensions that do wrong. Scientific men are criminal only, when their work is incomplete and perfection is pretended. This explains the situation of the fraudulent scientific reformer, and the continued preëminence of the practical taster. The producer, to-day, is at warfare with pseudo-science, the unobserving physician, the avaricious chemist, and the ignorant palate.

As Doctor Druitt, of London, says, "If a wine disagrees with you, no chemical certificate is worth a rush," and *vice versa*. No school of chemistry has yet produced a class of fine cooks, wine merchants, wine makers, vine-growers, or wine tasters. No great wine merchant, honest cognac dealer, or first class grocer or tea merchant, employs a chemist to purchase fine goods, or detect those that are inferior; but in such occupations the chemist is now busy in detecting the frauds of his own students.

These observations have a practical bearing. We need to encourage the development with us of expert critics, who depend upon natural gifts and the analytical power of trained senses, experience, and observation among men. In food matters, we are not yet ready to leave empirical methods for prophetic science. In our wars upon adulterations, chemistry alone must not be permitted to supply the evidence, unless it be to prove the attempt to imitate nature. Unless the chemist be epicure, physician, and social observer, testing his products by the rule of experience, his advice in alimentation will be dangerous. The "man of the world" often has more true science than the professional student, or fanatical reformer; yet he may be unable to impart and classify knowledge irregularly acquired or gained through the senses.

The wine taster is yet a necessity.

The physician, in his practice, must report the facts, with their connecting and complicating links, of his experience.

The consumer must believe in the evidences of his senses, and the comforts of his physical being.

The epicure must interpret his enjoyments and their causes.

The reformer must be honest in his observations, critical in the determination of sources of social trouble, and wise as well as just in the application of remedies.

The chemist must learn more, and redeem his profession from ignoble alliances, by becoming the earnest protector of the consumer.

THE GENERAL CHARACTERISTICS OF THE SOILS OF CALIFORNIA.—The reports of Professor E. W. Hilgard, of the State University, contain sufficient data based on chemical analysis to indicate the general characteristics of the soils of California. These show in general a medium range of calcareous, ferruginous, and potash constituents, together with a sufficiency of phosphoric acid for viticultural success. Humus varies as the lands are alluvial of the plain or sloping surfaces. There are many notable exceptions, showing high ferruginous, potash, phosphoric acid, and magnesia contents; but high proportions of lime are not frequently found. As compared with the analyses of other countries there are few instances here of any such poverty of resources as should cause any doubt as to comparatively certain crops; but the interest in the analyses turns mainly on the evidences of superior fertility. The experience of vine-growers throughout the State proves what chemistry might have predicted. At this time sufficient experimental work has been done in all sections to show, by practical examples, how the relative fertility of new lands may be judged. Where there is any doubt on this subject the University is constantly assisting the public.

Having referred to the essential conditions of choice vineyard land, I shall not undertake to describe in detail the many sections which are now being devoted to viticulture; for such information I refer the reader to the State University, promising at some future time, as we acquire more knowledge, to compile a special treatise on the subject, which will include what we may then know of geological formations, meteorology, chemical analysis, and the varying results of viticulture in their connection.

The accompanying table of analyses is taken from Prof. Hilgard's report for the College of Agriculture for 1882. It will serve to show how widely the work of investigation has been conducted, and will interest the viticultural student.

PREPARATION OF SOIL BEFORE PLANTING.—One of the topics in connection with the culture of the vine, which should be more generally discussed, is the preparation of soils before planting. The climate of California differs materially from that of any other well known vine-growing country. The rules that we may derive, on this and other operations, from experts, who have had experience in other countries, and from French and German works, should all be considered with reference to the climates of the regions where they prevail in practice. Sometimes the nature of soil must also be taken into the account of circumstances. Just as we can only in special cases safely follow the rules of the Rhine, Burgundy, and Bordeaux, in

Vegetation.	Insoluble residue	Silica, soluble in Na ₂ CO ₃	Total insoluble residue and silica	Polish	Soda	Lime	Magnesia	Brown Oxide of Manganese
White oak (Q. lobata), ash, sycamore, and grapevines	70.764	2.680	73.444	.652	.077	1.444	2.277	.015
Flowers and alfilerilla	59.144	3.160	62.304	.305	.221	2.909	1.042	.025
Grasses	63.268	4.750	68.018	.453	.113	1.460	2.174	.105
Cottonwood and willow	72.169	3.071	75.240	.267	.025	.794	.866	.025
Cottonwood and willow	61.029	8.033	69.062	.300	.124	.521	.768	.059
Grasses	55.283	13.940	69.223	.353	.065	.901	1.249	.111
Cultivated	67.334	3.671	71.005	.929	.124	.770	2.285	.106
Shattering oaks			72.058	.396	.479	1.927	1.640	.056
Grasses, herbs	75.405	8.286	61.903	.248	.404	8.502	2.700	.034
Flowers; some oaks and cottonwood	73.120	3.882	83.691	.423	.125	.758	.621	.038
Mostly grasses	67.519	3.282	77.002	.569	.094	1.316	.547	.036
White oak, wire and alkali grass; alfilerilla	67.519	4.259	71.878	.552	.657	2.599	.799	.066
Wild flowers; grass	66.470	4.950	71.420	1.224	.677	3.043	.087	.030
Cultivated	76.622	2.870	79.492	.714	.444	1.769	2.048	.041
Grass	79.518	3.219	82.737	.700	.286	1.246	1.578	.018
Grass			67.340	1.050	.840	6.510	3.960	.040
Grasses, herbs	80.328	4.345	84.673	.347	.058	.508	.588	.016
Grasses, herbs	85.874	2.705	88.579	.340	.248	1.163	.499	.034
Wild flowers, grass	73.774	3.491	77.265	1.221	.149	1.173	1.751	.027
Wild flowers, grass	66.079	3.378	69.457	1.817	.436	4.307	1.585	.078
Cultivated	87.060	1.980	89.040	.492	.305	1.198	1.069	.025
Shattering oaks	76.274	4.102	80.376	.500	.041	.104	.403	.009
Chaparral, poison oak, small oaks, and brush	63.384	5.480	68.864	.417	.052	.288	.207	.037
Chaparral, poison oak, small oaks, and brush	63.194	4.710	67.904	.467	.044	.327	.350	.029
Grasses; scattered poison oak	78.789	3.803	82.592	.249	.035	1.021	.471	.018
Grass, pine, and chaparral			69.520	.380	.070	.960	1.090	.390
Grasses, grass			72.980	.190	.210	1.190	2.320	.080
Grasses			56.610	.190	.140	.680	13.730	.080
"Blue" and white oaks, poison oak, grass, and flowers	67.915	6.964	74.879	.352	.126	1.544	.720	.031
Grass and "blue" oaks	73.352	4.506	77.858	.375	.125	.351	.840	.066
Grasses	79.078	5.544	84.622	.208	.111	.394	.361	.033
Grassbrush, creosote plant, grass	70.965	4.999	75.964	.928	.078	1.787	1.782	.026
Grasses			81.120	.270	.170	.680	1.770	.100
Grasses, herbs			86.210	.480	.140	.360	.540	.100
Creosote trees, creosote plant, and arrow-weed	58.574	5.327	63.901	1.177	.162	8.671	2.966	.025
Grasses	85.664	1.847	87.511	.634	.070	.759	.593	.025
Grasses, herbs	74.930	7.912	82.842	.621	.164	.952	.955	.036
Grasses	83.065	4.678	87.743	.506	.058	.561	.666	.055
Cultivated twelve years	85.596	2.567	88.169	.333	.109	.676	.526	.048
Cultivated	80.426	3.028	83.454	.343	.126	.502	.350	.014
Grass	57.440	5.114	62.563	.859	.260	1.987	2.428	.098
Cottonwood, pine, oak, alder, buckeye, and madrone	78.084	3.237	81.321	.541	.231	.925	.820	.039
Grass, large			77.844	.452	.074	1.050	1.211	.078
Grass, large			69.563	.348	.109	.998	1.913	.093
Scattered live oak, small			86.002	.189	.154	.484	.452	.038
Grasses, herbs, and some sycamores	71.156	4.938	76.094	1.143	.123	2.049	3.046	.044
Grasses and grapevines	76.089	6.839	82.928	.435	.123	.744	.578	.025
Grasses, manzanita, chaparral	34.392	14.110	48.502	.319	.058	.670	.712	.146
Grasses	65.346	6.896	72.242	1.127	.282	.105	3.329	.117
Grasses	69.373	3.588	72.961	1.134	.120	.101	3.239	.054

respect to selections of varieties of vines, time for picking fruit, duration of fermentation, etc., so we must be especially guarded with respect to the preparation and cultivation of land in a country where we have a rainless Summer and sometimes a season of comparative drought in Winter. With proper management of our soils our arid Summer becomes to us our great natural advantage, which insures the success of our commercial rivalries by diminishing our expenses and insuring a regularity of fair vintages.

To illustrate with an extreme case this necessity for caution on the part of the inexperienced, I will refer to the plantation of an immigrant from Lorraine in the Livermore Valley. He was a genuine French farmer from the German frontier, recognized the quality of the land he purchased, and (during the early Winter of 1882-3) prepared to plant his vines. I advised him to "do as we do" the first year, and then to teach us something the next, if he could suggest improvements. The land he had purchased had been left to volunteer a crop of grain. When the time for preparing land arrived he saw his neighbors plowing fourteen and sixteen inches deep, with strong teams of horses attached to single plows, for new plantations, and cultivating to remove every trace of wild vegetation, as well as to loosen and pulverize the surface among the young vines of previous years. He evidently thought that our methods were evidences of American extravagance. He contented himself with planting cuttings by means of a dibble, or planting bar, without plowing, saying that he wanted to save the green fodder (*fourrage*), and that he would keep the soil loose around the vines by hoeing during Summer. I told him what he might expect to happen—that his *fourrage* would not be worth cutting by hand, if he valued his labor, and his cuttings would perish from the Summer drought. It was in vain to instruct an experienced farmer, who knew that he could raise hay, and even vegetables, in a vineyard in the "old country." The result was as every Californian would have predicted; the season was comparatively a dry one, the volunteer grain was short and of little value, and the cuttings, as well as labor and time, were wasted. This year he has as clean and flourishing a young vineyard, after the California plan, as any one in the State.

We have learned some things in this State not to be found in the books, and with respect to the treatment of our own soils and vines with respect to our own climate, we must continue to perfect our methods through intelligent study and faithful adherence to the lessons of experience.

In cultivating the growing vineyards we have all learned how to maintain freshness in the soil by preventing the evaporation during Summer of moisture that falls in Winter, or that rises towards the surface by capillary attraction. The earlier planters, however, did not all appreciate the importance of breaking the soil deeply before planting, nor fully understand the best methods for doing so. Many, even now, shrink from the expense of thorough preparation and are satisfied to "take their chances," after the usual custom. It is common to see estimates of the cost of planting and conducting a vineyard published in connection with advertisements of land for sale, in which the public is led to believe that very little money is required for the purpose, although the profits proposed are enormous.

It is true that good success is often shown in light, sandy, and alluvial lands, with cheap preparation and cultivation, but even then

most of them rely on irrigation to save them from drought. It is, however, now becoming better understood that in many places, where irrigation has been practiced, better results may be obtained by proper preparation and cultivation of the soil. There are few districts in the State where the vine will not flourish without irrigation, provided that the subsoils are suitable and skillful culture is practiced. The exceptions require special explanations.

The arable regions along the Mediterranean coast of France, notwithstanding rains fall in such quantity in Summer that they would be considered annoyances to a California farmer, are called arid; relatively they are arid, and in appearance of vegetation they resemble our Southern California. The nature of their soils probably would explain their arid conditions under rainfalls that would be considered copious here. There they have learned that deep stirring of the soil before planting insures root development of vines that protects them against drought. Irrigation is not practiced.

Mr. Pellicot, in his work (*Le Vigneron Provençal*), enters into many details concerning the preparation of soil in that region, and shows that some even dig the land over to a depth of five feet, the minimum for good results being twenty inches. Care is taken in all cases not to injure the fertility of the soil by improperly mixing the different layers. Generally speaking, the surface soil should not be turned under unless the subsoil is of such a nature as to improve the conditions by so doing. Where very deep work is done, trenches are made, and in refilling from the sides the different layers are placed where they are supposed to belong.

In this State many new soils are very compact and have been rendered, by long years of idleness, practically unfit to foster root development. All farmers know what the crust is that underlies surface soil, that they have cultivated for grain, and how it often resists the action of the plow, while a few inches deeper a mellow earth is encountered. After this crust has been broken and the soil is stirred deeply, the atmosphere operates apparently as a fertilizer, drainage is facilitated, and plant life flourishes with great vigor. In some places farmers object to breaking the crust, because they say the grain will grow too luxuriantly and run to straw.

The aeration of soil in our dry climate seems to give new life to all its energies and sweetens its properties. It renders subsequent packing, before the roots of vines have adjusted themselves according to their natural tendency, impossible, assists penetration, and enables the fertilizing rains to carry soluble food to greater depths than formerly. Fertilization, without such previous preparation, becomes less effective.

We have soils such as loose gravelly "brush" lands, where root developments have already accomplished this desired preparation of the subsoil and permeated it with organic matter. In such places, vines grow with astonishing vigor, even with shallow preparation, but there are many vineyards which are planted where the subsoil scarcely shows a trace of even the rootlets of native grasses. Those who have conditions which make stirring the subsoil appear unnecessary may, perhaps, be wise in their economy, but I shall need further experience, from observation, before I make any exception when I have advice to give.

I have seen many remarkable proofs of the value of deep plowing (before planting) during the last four years, both in loose gravelly

loams and in compact clays and granite deposits. In a few cases the work has been thoroughly done to a depth of eighteen inches, but generally the limit for deep plowing has been fixed at fourteen. I am now so convinced of the advantages gained thereby that I shall not be content myself hereafter with less than twenty inches.

The reader is referred to Figure 16 of the original illustrations to this volume for an explanation of the theory of deep plowing before planting. The cut shows soils plowed eight inches and sixteen to twenty inches deep, with vine cuttings planted fourteen. The root developments from the start show comparatively the merits of the systems, and explain the results obtained by practical experience. How these results are affected by seasons of drought must be self-evident. The shallow root systems need irrigation in certain counties, where, by correct planting, the vines would be vigorous without such aid. In places where no irrigation is thought of, fruitfulness of the vine is delayed by shallow preparation of the soil; the extra profits of the early crops will more than pay for all extra expense in proper planting.

In deep plowing it is not necessary, and generally not desirable, to turn all the soil over. If your plow is made so as to cut a narrow land, with a mold-board properly and slightly curved, you will cut and push the land at the bottom of the furrow and turn over only the top, so that, while working fourteen or sixteen inches deep, you will leave behind an open furrow only about eight inches deep. The next cut throws top soil into the furrow and breaks up that beneath. Plows with subsoil attachments work very well, but cannot so thoroughly stir the soil. For plowing fourteen inches deep six good horses are generally sufficient, even in compact soil, unless it be too dry. In some compact granite soils, although they work very mellow, eight horses are required.

SPRING AND SUMMER CULTIVATION.—I shall not enter into all the details of culture, but refer to those which involve principles peculiar to our necessities. In my first annual report, the translation of the manual of Professor Foex, of Montpellier, contains all needed general instruction, subject to our local modifications.

The objects of Spring and Summer cultivation are supplementary to those of Winter and Spring plowing. They do not occur until after the necessity for plowing is passed, unless an open and comparatively dry Winter makes it necessary, to keep weeds from gaining ground. The word "cultivation" in this connection has a restricted and technical meaning, and refers to the operation of stirring and pulverizing the surface soil to a depth of from three to five inches, and destroying weeds. Besides cleaning the land, the effect of the work is to prepare a layer of finely pulverized surface soil, loose and dry, to prevent evaporation of moisture, to receive the penetrating atmosphere within reach of the fine surface roots, and to be acted upon by the chemical influence of solar heat for the future fertilization of the land. Evaporation is prevented by checking, at the depth of cultivation, capillary attraction; desiccation and sudden changes of temperature of the underlying layer of moist earth are prevented by the exclusion of the direct action of the air—the more complete the pulverization the more complete the exclusion of air in motion, and also the more readily does the sun act on the particles. In many cases also the maintenance of this loose dry surface layer,

especially if it be gravelly, free from dampness, will assist in ripening the fruit by maintaining warmth at nightfall.

How to accomplish this Spring and Summer cultivation, so as to gain all possible advantages of the system, is very largely a matter for local experience and ingenuity to determine. If vine-growers will accept and *adopt* the theory of its usefulness, without attempting to compromise with its necessities on the score of "penny wise and pound foolish" economy, they will soon find the best tools and methods of work suited to their peculiar land and labor resources. In most places where there is any cohesive tendency to the soil particles the operation involves two different actions. The first lifts, loosens, and stirs the soil to the required depth and cuts the weeds; the second tritulates and pulverizes the cultivated layer. The first is accomplished by an instrument, of whatever pattern, called a "cultivator;" the second by some form of "clod-masher," with a dragging motion.

Theoretically, perfect cultivation would contemplate a complete severance of the surface layer from the soil which is to be kept moist beneath, and should be completed by a thorough lifting of the surface and scraping action upon the protected parts beneath. If late heavy Spring rains have followed the last plowing, it may sometimes be necessary to plow again or to precede the true cultivator with an instrument to scratch and break up the compact surface, so as to render the scraping, lifting, and scarifying process easier.

The depth to which this cultivation should be practiced must be also determined by local experience. The vine-grower will not be long in discovering the most practical and effective methods of harmonizing his theory with practice. In very dry climates, especially where he is subjected to very desiccating winds, and where the usual atmosphere is very conducive to evaporation, he should work the surface deeper than where he has the benefit of moist sea breezes. In such places, also, he should never be content with simple cultivation, but should use the clod-masher or drag most thoroughly and as close to the trunks of the vines as possible. If the rows are wide apart he should draw the clod-masher more than once, back and forth. These operations should, also, wherever practicable, be conducted both across as well as lengthwise.

In some cases, no plowing is practiced in the vineyard, all the work being accomplished with the cultivator. This may prove satisfactory in some sandy, alluvial, and gravelly soils, but in most cases it is false economy. In soils which become compact after heavy rains, I have found no way to avoid the necessity of repeated plowing to prepare the surface for careful cultivation and to let the air and sun penetrate to the surface roots.

The best practice is, generally, to plow the soil from four to six inches deep away from the vines, crossing whenever practicable, as early in the Winter as the rains will permit. If time be lost in this operation, long continued rains may occur and prevent it being done until so late that weeds will be so advanced as to give great trouble in future operations. This trouble was very great during the last Winter. The rank growth of weeds developed, turned under by the last plowing, choked the cultivators and prevented perfect work in many cases; I was obliged in some places to do extra plowing and finish off with the clod-masher alone. By taking advantage of the early rains for the first plowing, the early sprouted weeds are turned

under, and, unless the rainy periods are long, or very frequent, opportunity to keep down the growth of foul vegetation by means of rapid cultivation, repeated as often as necessary, frequently avoids the necessity of any further plowing and keeps the surface in good condition for the Spring work after the rains are over.

If, however, the rains pack the soil after the first plowing, it is often impracticable to restore the condition of tilth without a thorough plowing and cross plowing; this may, possibly, in certain seasons, be required, even the third time.

We never know with certainty how late the Spring rains may occur. Sometimes the early Winter is very wet and the Spring is dry; in such cases, neglect to properly stir the soil with the cultivator at the proper time will result in a baked condition, impossible to overcome for the rest of the season. Never suffer the surface to remain compact and subject to baking after the middle of the Winter, if you can possibly avoid it. Even a slight cultivation at the proper time during cool Winter weather, will guard against this inconvenience.

After the first plowing the earth at the base of the vines should be hoed away. This has a sanitary effect universally recognized. Even if a second plowing be not practiced, the action of the cultivator and clod-masher will restore the level of the soil, and the part next to the vine will remain warmer in Spring and loose in Summer.

Weeds near the vines, and scattering ones which escape the cultivator, must be thoroughly removed by hoes, or by the hand. Plowing and cultivating, during the season when late Spring frosts are feared, should be avoided, if possible; and all weeds should be removed prior to that time, because their presence invites frost, and frequently causes damage to vines which would otherwise escape.

Where late pruning is practiced for any good reason, the plowing and cultivating must be modified according to circumstances. It is best, however, even where it is desirable to prune late to avoid frost, or to retard vegetation, to remove or shorten early in the season all canes not needed for fruit spurs, and to tie or shorten the others, so as to prevent danger of breaking them while plowing.

Ordinary fertilizers should be scattered or buried before the first plowing, so as to give opportunity for the Winter rains to act upon them.

CUTTINGS, OR ROOTED VINES.—Wherever cuttings grow easily, it is always best to use them in preference to rooted vines from nurseries. It is a recognized principle that vines raised from cuttings directly planted in the vineyard maintain their vigor longer than those raised from nursery stocks. Certain varieties, however, do not strike roots easily, and in certain soils all may be doubtful. In such cases, practical economy demands the use of stocks raised in nursery. Greatest caution, however, should be used in avoiding roots that may possibly have been infected by disease. In all cases, neither cuttings nor rooted vines should be brought into the vineyard without the most careful disinfection *as soon as they are received*.

For purposes of disinfection, we have found, by experiment, that immersion ten minutes in a solution of ten pounds of sulpho-carbonate of potassium, or of one gallon of "Little's soluble phenyle" to one hundred gallons of water, will neither injure vines or cuttings, nor fail to kill the phylloxera. In case of really suspected rooted vines, it would be best not to trust any disinfectant, for fear of some

accidental imperfection of work. There is no variety so valuable as to cause any one to take chances with suspected rooted stocks. It is much safer to trust to grafting hereafter upon such stocks as you can safely use than to rely even upon careful disinfection. There appears to be practically no real danger of conveying the phylloxera on cuttings, if the old wood is carefully removed from the base and destroyed by fire, if the removal was neglected where they were made.

Only one cutting should be made from a single cane unless the wood of the variety is very scarce, and that part near or including the buds at the base, is, to be preferred, according to nearly all authorities.

The best method for preserving cuttings fresh until planting time is to layer them horizontally with sand in a trench and mound the earth over them, excluding all light and air. If the trench is in heavy soil, liable to be drenched with water, it should be so constructed as to drain off promptly. The common practice of standing bundles of cuttings in a shallow trench, and attempting to protect them by simply mounding a little earth about their base, is often the cause of failure to obtain a good stand in the vineyard. The tops and centers of the bundles are very apt to become desiccated, if treated in this way. If it is desirable to keep the upper parts unburied, then the best plan is to stand them in a trench sufficiently deep to bury all but the top bud by filling sand compactly about them. The bundles should in all such cases be cut open so that the sand may compactly envelop them all. A cover of canvas or boards should then be placed over them to retard vegetation. If the cuttings have not been perfectly made, ready for planting, as is generally the case owing to the varying demands as to length, they should be prepared as desired before being trenched. All inferior cuttings should be laid aside for nursery work, for which at least ten or twenty per cent in excess of the number required in the field should be devoted, so as to provide for replanting missing stocks the next season.

The rule of length for the cutting should vary with local experience and careful examination of the root development of vines planted at different depths. Theoretically, the shorter the cutting the more perfect the root system, and the sooner will the vine bear fruit. Planters must adjust this principle to suit practical necessities. In the bay counties I have never seen the necessity of planting more than twelve inches deep in friable soils, or fourteen inches in cloddy land, which is liable to be dried out during Summer hoeing. For nursery work make your cuttings not to exceed twelve inches long, and bury them so as to leave the top bud an inch or two above the surface.

See that the soil is well packed, in planting, at the base of the cutting and do not plant in cohesive soils when they cannot be worked mellow. Let the soil above the base be snugly filled in but not packed, and do not permit it to become baked during Summer, to prevent which, don't delay the work of loosening, by hoeing carefully early in the season, and repeating the operation, if late rains pack it again. Not more than one bud of a cutting should be left above ground. The second bud should be placed very near the surface and the soil about it kept loose so as to permit it to push out a shoot, on which the first pruning should be done, if it develops sufficiently, the old wood and shoot above being cut away.

Plant cuttings in light sandy loams, or alluvions, if you desire, with a flat dibble; but, if you do so, make sure, by careful superintendence, that the men at work thoroughly pack the soil against the base. This may be done by putting the dibble into the earth, not in the same hole, but so near, that by a backward and forward motion the soil will be crowded against and around the cutting; then fill the second hole thoroughly, a good plan being to fill the bottom with a mixture of fertilizers, such as super-phosphate of lime (or bone meal), wood ashes, and a little sulphate of copper, mixed together with fine dry loam.

See that the base of all cuttings is cut off very close to a bud, where the cartilage of the cane presents a solid appearance. This is often neglected by those who make cuttings for sale.

In cohesive soils it is always best to plant cuttings or vines with a spade, being careful not to plant except when the soil is mellow. A little fertilizing mixture, but not unrotted manure, stirred in the soil *under* and about the base of the cutting or rooted vine, will naturally assist in securing a vigorous rooting the first season. The dealers in fertilizers will provide the best materials; about sixty pounds to one thousand plants, added to a little fine loam, being an ample supply, or an ounce to each one. A little sulphate of iron is a valuable stimulant.

Before planting rooted vines, take pains in pruning the tops to one short spur of not exceeding two buds, and in shortening and thinning out the roots; scattering rootlets along the main stem should be cut away. The defect of rooted vines when transplanted, is their disposition to make a tangled ball of rootlets; the aim should be to provoke a simple and branch-like system. Some practice cutting back all roots close to the original cutting. I have tried myself the plan of cutting away all but two roots on one side of the base, shortened to about six inches and planting against the back of the hole, first throwing in a shovelful of soil mixed with fertilizers, so that it inclines downwards from the side where the base rests; the subsequent filling in and pressing of the soil operates to depress the two roots as they should be desired to grow, without complicating the labor of the workmen. In practical work, when roots are left on all sides, the tendency is to press them so that their ends turn upwards. Dig the holes for rooted vines and cuttings at least a few inches deeper than necessary, and throw surface soil to the bottom when planting.

A smooth straight wire with drops of solder fastened at the required marking distances, is the best instrument for laying out the work. When the field is large or undulating, the services of a surveyor in locating corners of blocks, the length of your marking wire or chain, will save many accidents, and generally be an economy of labor. An exactly laid out vineyard will always be a pleasure to the eye, worth more than it costs to avoid irregularities. Small slips of wood (split shingles, or any other kind) with tops dipped in whitewash, will not cost much, and can be used rapidly in laying out the land. Otherwise you may stretch your wire and plant against the indicated points.

If cuttings are carefully preserved, late planting is not so much to be feared as early planting in stiff wet soil. In light loamy or sandy soils, it is well to take time as it offers, and so avoid a rush of work. By deferring planting as late as is safe and practicable in stiff or cohesive soils, you reserve the opportunity to plow or cultivate the sur-

face, if it has been packed by rain, or if weeds are troublesome, before planting, when it can be done thoroughly and more economically. It is desirable, however, that there should be one good late Spring rain after the vineyard is planted, to promote the success of the stand.

Do not be caught napping after the Spring rains, in keeping the land well cultivated. You will generally find it necessary to be very prompt and rapid with the first work, to prevent harder work later. Those for whom these cautions are unnecessary are happy in their circumstances.

In buying horses or mules for vineyard work, you will find it great economy and comfort if you have selected strong sound animals. Horses weighing not less than eleven hundred pounds should be preferred. Small cheap stock is a snare and a delusion.

VINEYARD TOOLS.—I shall not undertake to describe vineyard tools; we have a great deal yet to learn in this respect. Those who have different patterns for sale should make an exhibit at the time of our next State Convention, and endeavor to instruct the public as to their relative merits. No doubt there are many improvements possible.

DISTANCE BETWEEN VINES.—No positive rules can be laid down to govern the question of the distances at which vines should be planted in the vineyard. The nature of the soil, the habits of the varieties cultivated, the methods of pruning to be adopted, and, in some cases, the relative steepness of hillsides, must be considered in solving it. The economy in the use of tools and horses in cultivation will also control it within certain limits. With respect to the latter restriction, experience indicates that a distance of seven feet apart each way is quite practicable, although some prefer eight feet. For varieties requiring short spur pruning and trained after the goblet system, best known in California, planting from seven to eight feet apart will probably remain popular. I have not seen any places where I would increase these distances for such pruning, although I might favor planting closer under some circumstances.

Whatever system of pruning is adopted, the vine must, for economical reasons, be restrained in development within such limits as are consistent with practical and profitable culture and the proper maturity of the fruit. The soil occupied by the roots should correspond with the proper natural development of the plant above ground, according to the manner of training it. The roots should have resources for the complete development of the desired form, no more and no less. A vine should not be trained to become a tree, because its fruit will not mature when elevated too much. The nearer the soil the better the fruit, and the less danger from oidium. In the goblet system, the vine cannot be spread out so as to keep the fruit low down without interfering with cultivation. The increase of the distance would necessitate greater development of the form to save excessive vegetation and avoid *coulure*. In some cases less distances would insure finer fruit and diminish chances of *coulure*; but economical culture might prevent the change. A modification might perhaps be made for some places by planting four feet by eight feet, and doing cross work with single horses.

Other distances will be considered in connection with pruning and studies of particular varieties.

PART IV.

GENERAL PRINCIPLES GOVERNING THE VEGETATION, PRUNING, TRAINING, AND MAINTENANCE OF THE VINE.

VEGETATION OF THE VINE.—The viticultural zone is limited by certain degrees of temperature, and atmospheric humidity. With reference to certain species these limits are variable, so also with respect to different varieties of the same species. Certain species of American vines appear to have a wider range of adaptability than the *Vitis vinifera*, the European, or Asiatic species, which is most cultivated in California; the humidity, which is fatal to the *Vitis vinifera* throughout the United States east of the Rocky Mountains, does not prevent the successful cultivation of the *Vitis riparia*, *cordifolia*, etc., while the latter flourish in the regions of the former.

A general rule may be given as follows: In proportion as the atmospheric humidity diminishes during the season of vegetation, the conditions for viticulture improve. Partial exceptions may be taken to this rule with reference to some varieties of vines, which appear to produce their best results under certain degrees of moisture, but it is not shown that they do not vegetate and bear fruit, irrespective of the degree of quality of product, more successfully as the humidity decreases. Whether there is any limit to the aridity of atmosphere under which the vine will flourish has not been determined within my knowledge. On the Pacific Coast we have practical proofs in Fresno and San Bernardino Counties, and in Arizona, that with a sufficient supply of terrestrial moisture, extraordinary fertility accompanies extraordinary atmospheric aridity.

In Europe and Northern Africa the greatest fertility, vigor, and longevity of the vine appear to be coincident with the greatest evaporation, caused by heat and relative aridity during vegetation. As the average Summer rains increase, unless there be a corresponding increase of temperature, the number of varieties that may be cultivated with success, diminishes. Some varieties, such as the Spanish *Moscatel*, attain perfection only under a comparatively clear sky with a minimum of rainfall, an average moisture without fog or precipitation, and an equable, warm, evaporating air. The greater the moisture the greater the heat required to mature the fruit and ripen the wood. M. Boussingault, in publishing his observations as to the effect of Summer rains in the vineyards of Smalsberg, said that the quantity of rainfall did not, apparently, affect the quality so much as the quantity, the largest crops being during seasons of least rain. More precise investigation shows that the best seasons were those in which the least rain fell before the bloom and at the approach of the vintage. M. de Vergnette remarks that in the Burgundy district, comparing the vintages from 1838 to 1844, inclusive, that of 1838,

preceding which the least rain fell, produced the most solid wines. These conclusions lead one to believe that the varieties of vines which appear to require the climates of Bordeaux, Burgundy, and the Rhine, to produce their finest wines, depend on the temperature of those regions rather than upon their humidity; that in the regions where they produce their finest results, quality is improved by diminished humidity during the season of vegetation, and especially as the blooming and maturing periods approach.

Careful observations made by Humboldt and others, as commented on by Professor Ladrey, show that a certain range of equability of temperature is also necessary to viticulture; notwithstanding the sum total of heat during a season may be sufficient, certain extremes of cold are fatal to success. In Europe it is not sufficient that the temperature during Summer and Fall should attain a certain average, but from the time that the berries first appear, the average of no month should descend below 19° Centigrade.

Tested by these rules of experience, the climate of California, where the season of vegetation for the vine is rainless, should prove to be more favorable for viticulture than that of any part of Europe. There would remain to us to adapt varieties with reference to the temperature.

The average temperatures for the seasons at Bordeaux, as given by Humboldt, are as follows: for the year, 13.9 C.; Winter, 6.1 C.; Spring, 3.4 C.; Summer, 21.7 C.; Autumn, 14.4 C.; coldest month, 5 C.; warmest month, 22.8 C.

In Alsace, the years of fine vintages, from 1811 to 1857, showed average temperatures as follows: for the year, 11.25 C.; from April 1 to September 30, 17.50 C.; June 1 to August 31, about 20.50 C.; May, from 14.62 to 18.45 C.; September, 15.02 C., to 18.20 C.; maximum for the Summer, 33.01 C. to 34.40 C. Temperatures, averaging less than these, marked years of ordinary or inferior vintages.

In the Burgundy district (Côte d'Or) the average maximum temperatures for the seasons between blooming and vintage for the years 1838 to 1844, varied between 20.88 C. and 24.29 C. The year of finest vintage showed an average maximum for the season of one hundred days of 22.10 C.

During Winter it is recognized that the *Vitis vinifera* may sustain a fall of temperature to 20° C. below zero. Below that many vines are destroyed. Under certain atmospheric conditions vines have been killed at -14° C.

During Winter the vegetation of the vine is arrested. In the Spring, when the average temperature reaches 10° C., the buds swell, and vegetation commences. When suitable temperature occurs the bloom appears; but the fruit does not attain maturity, generally, until Autumn, after which the leaves fall, and the canes of the year ripen.

The first vegetation occurs under the influence of the mildness of the weather and the humidity of the soil, by the direct action of the extreme rootlets. Early cultivation stimulates this action. Absence of cultivation retards it. The water that is absorbed by the roots contains in solution mineral substances, and a small quantity of organic matter, the latter being obtained from decayed vegetation, rain, or fertilizers. Carbonic acid and oxygen gases may also accompany this first supply of weak nutriment, which is the source of food for the swelling buds and unfolding leaves. Analysis of the

tears of the vine, which appear at the time of the bursting of the buds, has shown 99.47 per cent of water, and 0.53 per cent of dry residue, in which have been found chloride of calcium, sulphate of potash, bitartrate of potash, tartrate of lime, malic acid, malate of potash, albumen, and ammoniacal salts. It is supposed that the oxygen of the atmosphere, penetrating the soil, has modified some of the substances absorbed by the roots. It is possible that the early cultivation of the surface of the earth may have operated in this way to assist in enriching the solution circulating in the vine. I find no authority for the statement, but am inclined to believe that the action of the roots, in assisting the elaboration of the sap, does not cease after this period, but that careful cultivation, and the preservation of a porous soil and moisture about the surface roots, stimulate growth, directly as well as indirectly, by means of the oxygen, nitrogen, and carbonic acid gas of the atmosphere operating under the influence of solar heat and moisture. If this supposition be true, it may explain the value of gravel in maintaining the temperature about the roots, as well as in radiating heat for the vegetation above. Authorities, however, appear to concur in attributing all subsequent absorption from the soil and elaboration of sap to the influence of the new foliage.

As soon as the new leaves appear they not only evaporate the water of the sap, but also, under the influence of light and the atmosphere, inhale and elaborate the elements of organic matter, which, in turn, under the influence of heat, unites, more or less, with the minerals brought in solution from the earth. The flow of aqueous sap is excited by the vegetation and is enriched from the atmosphere as the foliage increases. The new growth is formed out of deposits taken from the sap as it becomes enriched, and the process of elaboration and organic changes and combinations with minerals continue until the season of vegetation has accomplished its purposes. Soon after the appearance of the foliage a conflicting action in the appropriation of sap occurs. The blossoms, fruit, and fruit stems contend with the growing canes for their supply of nutriment. As one writer illustrates this conflict, the fruiting organs are the natural parasites of the vine. They are, however, weakly endowed with the power of elaboration, in contrast with other green parts of the herbaceous growth; so weakly that when there is not enough for both and vegetation is excessively stimulated, the leaves may rob the fruit and cause its suffering or destruction.

All the elements that the vine requires to produce organic matter may be obtained from the atmosphere, the elements being carbon, hydrogen, oxygen, and nitrogen. Under the influence of light, the new vegetation inspires carbonic acid gas and exhales oxygen; when light is removed this operation is reversed. The carbonic acid gas, united with water in the sap, releases oxygen and forms in the green parts of the foliage organic substances, of which tartaric acid may be called the type; carbon, hydrogen, and oxygen, in different proportions, unite to form vegetable acids, cellulose, fatty matters, sugar, etc., all of which, by the action of oxygen, may be consumed and reconverted into carbonic acid gas and water. Such combustion in fact does take place in parts of the growth not green, and more or less carbonates are formed. Nitrogen unites with the organic substances to form albumen; organic acids with the minerals, potash, lime, etc., to form organic salts. Finally, by a change in the relative

proportions of carbon, hydrogen, and oxygen in the acids, sugar is formed.

I shall not enter into the details of these formations and transformations; sufficient is related to form the basis of theories governing pruning, training, and fertilizing, and the control of the *coulure*, concerning which I shall have something to say.

It is evident from this exposition of the manner and resources of the phenomena of vegetation, that under the influence of a dry and warm atmosphere, evaporation of the watery parts of the sap through the foliage will continue, and the condensation of the mineral solutions will increase; the absorptions from the earth increasing with the evaporations. The upward force will continue the elongation of canes and the creation of new leaves; an excessive flow will even force lateral growth from the eyes destined by nature for the next year's development. If light be sufficiently supplied from the solar rays, the green parts will elaborate organic matter, drawing upon the atmosphere for supplies, and imparting material for the maintenance, solidity, and healthfulness of the new growth. As the sap, through evaporation of water and the elaboration of organic matter, together with their mineral combinations, becomes richer, the new growth becomes firmer. If heat is withdrawn while the flow of weak solution from the earth is rapid, evaporation, more or less, ceases, and watery shoots are created, which drain the sap to its utmost capacity for the supply of nutriment for the new tissues. If light be also wanting, by reason of continued clouds and mists, or the shade of dense surrounding vegetation, the supply of new organic matter is cut off, and the carbonic acid inhaled may be exhaled; the vegetation becomes sickly and even decays. Sickly, watery growths are rapidly seized upon by fungoid parasites, and rotted, or they may be scalded by the first hot sun, or withered by cold.

Poverty of the sap, together with increased demands made upon its resources by the leaves, starves the bloom and early forming fruit, and renders these germinal organs watery and sickly, a prey to fungus, hot suns, dry winds, and cold. The disease that is caused by these circumstances is called *coulure*, or blighting of the blossoms, or dropping of the forming fruit.

But other circumstances may prevail. The period of vegetation preceding and during blooming may be characterized by moderate well drained moisture at the roots, gentle atmosphere, and a clear sky. The result will be a moderate flow of sap and evaporation, a rapid elaboration of organic matter, the deposit of firm vegetable tissues, and the rapid development of the fruit.

Unusual warmth and moisture, at the time of blooming, will stimulate a sudden flow of sap and new foliage, withdrawing support from the fruit, and subject the latter to decay from fungoid attacks, or subsequent changes of temperature.

Unusual warmth, together with an insufficient supply of moisture, will create evaporation and withering of the foliage and fruit; the former may recover, when the latter is ruined.

Excessive moisture in the soil, not freely drained, by diluting the soluble elements supplied to the roots, will also cause poverty of sap, which, unless attended by very dry evaporating atmosphere, will be most conducive to *coulure* and to fungoid attacks upon all parts of the new growth. A mild, warm, humid atmosphere will intensify the

development of fungoid germs, while preventing the evaporation necessary to furnish solid resisting tissues.

But the conditions for forming rich sap, firm tissues, and sound fruit, may have been favorable, and the vegetation proceeds towards the Summer promising success.

A humid atmosphere, clouded skies, and developing fungoid parasites may prey upon the foliage and destroy the fruit.

Excessive drought and a desiccated soil may fail to furnish requisite moisture, suspending vegetation and shrinking the fruit.

Excessive vegetation may ensue and delicate tissues be formed; hot dry winds and burning suns may scald the exposed fruit and tender new leaves.

Favorable temperature and excessive moisture in the soil may cause an abundant foliage with large watery bunches of fruit. Or favorable conditions of all kinds may carry the vegetation to Autumn with firm tissues and fruit well provided with sap rich in organic and mineral matter.

The closing Summer and early Autumn may be damp and cloudy yet warm; the rich sap will be diluted by the fresh flow stimulated by the foliage, the absence of light failing to complete the elaboration, and the moist atmosphere preventing evaporation. The cold weather soon coming on and checking vegetation will leave on the grower's hands unripe fruit to reward his toil. Or the heat and light of Autumn, following a season of fine vegetation and excessive moisture, may operate on an abundant crop of fruit, rich in organic matter but poor in minerals. The result will be plenty of sugar and free acid, no sub-acid flavors, insipid sweetness, fruit that will decay readily, wine that will lack excellent flavor, and trouble the cellar master with excess of albumen and mucilage.

Spring may be mild with clear skies; land may be well drained furnishing moisture rich in soluble minerals; Summer may be warm, atmosphere clear, skies bright, and soil fresh and moist; Autumn may be warm, atmosphere dry, skies bright, and the diminishing moisture of the earth may check the aqueous dilution of the sap, ripening foliage and terminating vegetation while the fruit finishes its elaboration of aqueous sap and chemically transforms acid into sugar and forms organic salts, coloring acids, tannin, and all other components of perfect fruit that will resist decay and gratify the palate in whatever form it is consumed.

The vine produces its fruit upon the shoots growing from buds on the new wood of the preceding year. A few varieties form exceptions to this rule; they may bear fruit on shoots springing from the old wood.

The fruit-bearing canes, also, are those which grow on wood of the preceding year; it requires two years' successive growth to produce fertile canes. To this rule are the few exceptions noted in the preceding paragraph. The cane grown from wood more than two years old is not fruit bearing, but will produce new canes with fertile buds the following year.

The buds of the fruit canes are not always equally fertile. Some varieties produce very little or no fruit from the buds nearest the base of the canes, others have fruitful buds from the base outwards.

The tendency of the sap is to flow upwards and force the greatest

development from the uppermost buds. The force of this sap in Spring has been measured and found capable of sustaining a column of mercury thirty-two to forty inches high, equivalent to a column of water thirty-three to forty-six feet high. This force is scarcely illustrated by this method of investigation, for it is known to send sap to the uppermost vegetation of trees more than two hundred feet high. There appear to be also exceptions to this rule.

When sap is deflected from its perpendicular tendency it rushes to the extremity of its canals unless it again meets with obstruction, in which case it forces open the last bud it meets before meeting the obstruction.

When the growing shoots of the year are checked in their longitudinal extension, the sap elaborated in the leaves returns by the cambium layer and seeks new outlets. Elaborated sap, in excess of the demands of the new growth, creates a circulation which causes new elements of growth to all parts of the vine. When the ascending sap is rapid, especially when it is excited by the pumping process of vigorous foliage under a hot sun and freely supplied by an excess of water in the soil, the effect of checking the terminal growth of the new shoots is also witnessed in the development of the buds in the angles of the leaves into new lateral shoots. These, in turn, may also send forth a third series of new growth.

The buds formed in the angles of the leaves contain the fruit resources of the ensuing year. Each bud has four eyes, two of which may bear fruit and two of which are barren. The development of the lateral shoot, during the season the bud is formed, carries with it the fruiting principle of one of the fruitful eyes, and may bear fruit if sufficiently nourished by sap. This is called the second crop. A third crop may likewise be formed on the next series of laterals. In some cases the second and even the third crops ripen.

If all the first shoots of a vine are pinched, at their extremities, early in the season, a vigorous development of laterals will take place. This pinching back may have the effect to benefit the fruit of that season that was forming in the incipient bloom at the time the pinching was done, but authorities concur in the statement, that if it be practiced regularly upon all the first shoots of the vine, sterility will be induced in future seasons, which will not be avoided until after the normal development of the canes, or at least of those needed for the next season's pruning, has been permitted. This result is no doubt caused by the exhaustion of the fruit bud, at the base of the lateral, which is to produce the next year's crop.

Whenever laterals are forced out naturally by excessive vegetation, if they are pinched as soon as they show a few inches in length, leaving two or three leaves on them, these latter have the effect by encouraging a return flow of sap to enrich and strengthen the fruit buds at their base and so to benefit the next year's crop.

Each arm or branch of a vine develops a corresponding root or system of roots to supply its needs. If one arm is permitted to develop more wood than another, the corresponding root developments will also take place. The suppression of a vigorous member of the vine affects the use and development of its corresponding member or members; hence the injury of a certain main root may affect only a certain branch of the vine, and by the same reason the violent suppression of old established branches works injury to the root system. When one member of the vine is suppressed its root

system endeavors to force a new growth in its place; if it fails, disease may result. Experience has, therefore, proved that it is the best to rejuvenate an old vine by carrying up a sucker, and afterwards cutting out the old trunk; or by simply cutting off the trunk below the surface of the ground, and developing the suckers, which will be forced up to take the place of the branches that existed before. For the same reason it is best to put more than one graft into an old vine, each of those put in, within reasonable limits, developing as rapidly as either would alone. (I have proved this theory by actual experiment. Two grafts were put on opposite sides of an old Mission vine root, eight inches below ground. Both grew luxuriantly last year, and made canes many yards long. This year I suppressed one of the grafts. The other, instead of making superior development, appears to have been checked in its vigor. The normal growth of the vine has been checked, and only a portion of the roots is in healthful condition.)

PRACTICAL APPLICATIONS.—The practical applications of the principles discussed under the preceding topic will be referred to under the heads of pruning, training, grafting, fertilizing, etc. There are some lessons to be drawn from them, however, of a nature that points to meteorology and geology, operating through botanical principles, as the source of many mysterious results heretofore referred almost wholly to the chemical constituents of the soil. What is known as good wine contains fairly balanced proportions of spirit (the product of sugar), sub-acid organic salts with mineral bases, acids, glycerine, etc. The mineral parts, taken from the soil, do not vary extensively, except as they are combined with organic acids. These acids are themselves numerous by reason of their many modifications, some of which are discernible only by means of the polariscope. They are all composed of elements that may be obtained from the atmosphere, or may be more or less dependent upon the preorganic history of the humus in the soil, which chemistry has not yet fairly had time to consider. Moreover, the essential oils and ethers, coloring matter, tannin, etc., are all of pure organic origin; and may be derived entirely from the atmosphere. The great field of inquiry is therefore as to the organic elements, which vary so widely and are so complicated that chemistry has yet only looked in at the vestibule of this department of science. That which gives delicate shades of aroma, flavor, and bouquet to a wine is evidently of organic origin, and its source must be sought in the variety of vine, the atmosphere and its climate, the geological conditions that influence by porosity, warmth, etc., the supply of sap, and the normal development of the natural characteristics of the vine, which is the original quality producer, and the true nature of organic matter in the soil. One might as well seek the source of English and Scotch character, art, science, and religion in the soils that produce their bread and meat, as to dig for the secrets of a noble old wine into the lime, potash, soda, magnesia, iron, clay, and sand of the vineyard. These minerals no doubt, by their absence, cause certain defects, and by their presence in unusual proportions may modify the general structure of a wine; but they exert about as much influence on the character of a fine wine as the salt, lime, and phosphoric acid in the food we eat exerts upon the identity of the human countenance and the tone of the prima donna's voice.

Wet lands give green grapes and wine that will not keep. Moist

lands give free acid and sugar. Dry lands give much sugar, little acid, and full body. These things are explained by the rules that govern the vegetation of the vine. In this State we shall see that excessive Summer irrigation on poor lands in hot dry climates will give sweet but insipid fruit, unless fertilization may cure the defect of mineral richness in the sap. Thin wines, with excess of organic matter, difficult to clarify and hard to keep, even with abundant alcohol, will come from thin irrigated soils in hot dry atmospheres. Thin acid wines, with little alcohol, will come from moist lands and cool moist climates. Wines, rich in bitartrates and other organic mineral combinations that give durability and flavor, will come from fresh, well-drained, porous soils, under clear skies, and warm equable climates. Wines with ample alcohol, no free acid, small percentages of bitartrates, little bouquet (for want of acid), and sherry-breeding properties, will come from soils having a modicum of moisture—enough to maintain vegetation with no more vigor than is required for the creation of organic acids and their subsequent conversion into sugar, evaporation carrying off all excess of water. Irrigate and fertilize such a sherry district, and plant later ripening varieties, and we shall have light table wines with free acid; plant later ripening varieties, pick fruit before over-maturity, avoid irrigation, and we shall have table wines with sub-acids and bouquets, if the varieties are capable of producing them.

As to the fine distinctions between wines of adjoining vineyards, they are only fine with age, and then they refer mainly to the combinations with organic acids; great distinctions which the human senses perceive, but which chemistry has not been able to trace, because they lead into the labyrinth of delicate organic combinations. The meteorological and geological conditions of two pieces of land are never exactly alike; for slight organic differences, we need only to look for slight physical differences of condition in production.

PRUNING AND TRAINING THE VINE.—The principles on which intelligent pruning and training of the vine are practiced are based on a knowledge of its vegetative habits, considered economically and with reference to local peculiarities of climate, fertility, and soil. I have already given to the public, in Appendices I and II to this report, translations of practical manuals, containing instructions for the management of vineyards according to the most important systems known in France. The systems, explained therein, are all accompanied by discussions of the principles that govern them, and should be carefully studied by vine-growers. Those who desire to know more of the many modifications practiced throughout France, and who are conversant with the French language, should purchase and read Dr. Jules Guyot's great work—"*Etudes sur les Vignobles de France*." The vine-grower should hesitate to condemn the careful practices that centuries of experience have taught to viticulturists in countries where they have included in their number a large class of educated and distinguished students. The most successful systems in use on the Rhine are consistent with the principles elucidated by the French works, modified by conditions of climate. Southern countries have made little progress in rational culture, except as they have begun to apply the knowledge acquired from French and German studies. This is as true of vinification as it is of viticulture; the exceptions are notable instances.

The researches of Dr. Guyot show conclusively many defective methods in actual practice, and have been of great value to the public, because, by skillful pruning and training, the vine may be made to yield its greatest possible crops, consistent with its health and the quality of its produce. Careless pruning may and probably does reduce the annual average profits of the vineyard at least fifty per cent.

I did not present the methods of the Burgundy district, because they are quite impracticable in California at the present time, and are only applicable to such vines as the Burgundy *Pinots*, and countries where labor is plentiful and wages low. As a substitute for the Burgundy methods, the Guyot, Cazenave (*unilateral cordon*), and Chaintre methods (see Appendices I and II) may be applied more economically in California.

The systems, as described for French and German practice, have reference to climatic conditions, as well as the development of the vine, and many of the requirements are costly. In this respect, they may nearly all be modified for the climate of California. Our own experience must teach us how to make such modifications and improvements as our varying local conditions may require or render practicable. We must not, however, be deceived by temporary results, when violating general rules, long established, nor by the profitable returns from vines that have been only a few years in bearing. According to the nature of soil, the distance between the vines, methods of culture, vines will not attain their full development so as to demonstrate the practical value of any new systems until they are at least eight years and generally, as we plant them, not until they are twelve years old. Defective methods practiced during those years frequently destroy the fertility and quality of crops of after years, and evil effects may be very difficult to overcome by applying new methods after the root system, trunk, and branches have been formed. The fact that there is an intimate connection between each developed and established branch and its own system of sap canals and roots should never be overlooked. Our Secretary will give his own observations in noting the demonstration of this principle, when experimenting upon vines by injecting substances into the sap canals. He found that where he could trace the substances from the point of injection, they were found not generally diffused, but following certain lines and branches. Experiments with electricity have shown similar results, the current following certain roots into the earth and avoiding others. This principle also governs the pruner in preserving the equilibrium of branches. In the Saint Macaire system (see Appendix II), it is necessary to fix the long fruit cane on each branch on alternate years to prevent the irregular development of different parts of the vine. The same is true of all long pruning as practiced in this State.

The principal distinctions between the applications of different systems to France or Germany and California, are those which arise from relative humidity of atmosphere, clear skies, solar heat, dry winds, and the warm dry condition of the surface soils. With respect to frost, the rules are the same for all countries. Where there is humidity, in Summer and Autumn, of atmosphere and surface soil, the fruit must be elevated, either by keeping the arms at sufficient altitude, by fastening long canes to supports, or by tying the young and growing fruit-bearing shoots to stakes, wires, slats, etc.,

the object being to keep the fruit from touching the soil. When humidity and a lack of relatively abundant solar light and heat preserve green vegetation, and ripening of the fruit is retarded by lack of evaporation and light, it becomes necessary to repress growth, by cutting the tops of the canes and stripping the foliage. In these respects the dry atmosphere, clear skies, lack of Summer rains, and arid condition of surface soils, render these precautions seldom necessary in California. The cost of applying the improved systems for long, or alternate long and short, pruning, will be much less here than in Europe, where they are taught. There are, no doubt, places in this State, especially where moist sea air maintains vegetation late in the season, and where irrigation keeps the surface moist, in which the practice of supporting the fruit will be required. I have also seen instances where stripping the foliage might be useful. In all cases where fine table fruit of varieties ripening late, and liable to rot, is the object of the grower, it would be prudent to guard the vines against early Autumn rains. Of the wine grapes, which require long pruning, there are few which do not ripen sufficiently early to avoid the early rains; and it is only in regions near the coast, where evaporation is not rapid, and the atmosphere is humid from the sea, that I have observed any failure to ripen well, where these grapes lie on the ground. If there are local exceptions, the grower will learn them by experience, and know the remedy. As to excessive heat in the surface soil, I have seen more injurious effects on fruit raised up than on that which lies on the ground, covered and protected by the foliage.

SHORT PRUNING IN GOBLET SHAPE.—This is the ideal system for nearly all fertile vines, which produce good crops from short spur pruning. It is the one most generally attempted in California, and in all districts I have found good illustrations of its proper management. But there are many who do not observe proper rules even in this simple style. Many do not preserve the successive growths and the systematic development of the arms; they also frequently neglect to preserve a sucker at the lower part of the arm to prune upon, when they desire to reduce the old wood; they are apt to saw off the old wood without first providing for its resuscitation and the normal relations between its development and the roots pertaining to it. Many, also, cut away the old wood indiscriminately and reduce the trunk to a mere irregular stump. In such cases, great loss to the vine-grower is experienced by the frequent selection of unfruitful wood for the spurs by careless pruners. All systems should be conducted according to some model, which the workmen can easily understand. It is easy to determine the true fruit wood on the prolongation of the arms, where the successive growths are discernible; but it requires close observation to select the proper places to cut, where there is an irregular matted mass of canes, and the form requiring constant changes. From such errors come a waste of vegetation and irregular relations between roots and branches. These are more apparent where the vines have the most room to grow in, because the top is never in harmony with the extent of root development.

The instructions given by Cazenave (see Appendix II), are simple enough if carefully followed. They are, however, defective as to the number of buds to be left on the short spurs. Every vine-grower

should examine carefully the habits of each variety of vine before determining a rule in this respect. The *Moscatel* (*Gordo Blanco*, etc.), bears well on the first bud, and two buds are sufficient for this system; but by comparing the *Mission* in many places I find that it gives its best fruit from the third bud. Other varieties might require four, or even five.

Where more than two buds are left to the spur, careful attention should be given to the practice of what the French call *epamprage*, *ébourgeonage*, *pincage*, and *rognage*. As we have no proper terms to distinguish all these operations with certainty of meaning, we should adopt those that we may agree upon.

Suckering and Epamprage.—Those shoots which spring from the old wood of the vine, and not from the buds on the canes of the preceding year, are generally called by our vine-growers “suckers,” although in other cultures this term is applied generally to the shoots that start from the roots, or near the surface of the soil. The French call these generally infertile shoots, *gourmands*. All vine-growers speedily learn the importance of removing the suckers early in the season, in order to prevent false growths that will trouble the pruner in Winter, and to prevent them from robbing the vine of sap needed for the true fruit wood. It will be noticed that suckers occur more frequently on vines that have been irregularly pruned; this is probably due to the efforts of the plant to restore arms that have been removed, and suckering may not have in such cases all the desired effect of turning the sap to the profit of fruit wood irregularly placed. Their suppression, however, will have a tendency to prevent the development of useless root systems.

Sometimes it becomes necessary to permit, more or less, the suckers to grow. This happens when the arms of the vine are too long or in bad shape, in which case new ones may be established from the suckers, but when selected for this purpose they should spring from the arm itself.

Sometimes it is necessary either to lower or elevate the head of the vine. In such cases a sucker should be saved from the lower parts, near to or beneath the surface—the latter being preferable. Where the vine has attained large size and has numerous branches it would probably be better to take up at least two suckers from opposite sides—keeping them near together, after the old trunk is cut out, by proper fastenings. Such suckers should be trained up and encouraged to make vigorous growth, while the wood on the old arms is reduced by pinching and Summer pruning. If the vine is large it would be best to prune these suckers back to one or two eyes the following Winter, and to repeat the treatment another season before taking away the old trunk. This rule should be applied also to suckers that are intended to replace old arms; the old wood not being cut away until the new one at its base is sufficiently developed.

In some cases suckers may be left to protect parts of the vine exposed to violent heat and dry winds, but the aim of the pruner should be to prune upon them afterwards so as to avoid the necessity in the future.

Whenever frost has killed the new growth in Spring the suckers should not be removed until there has been sufficient development to determine where the wood of the next year is needed and the sap has been provided with ample outlet. The same rule must prevail

for vines whose canes have been injured by early Fall frost. The suckering should not be done at a time when the spurs left in pruning show signs of failure to vegetate.

Sometimes, especially with young vines, the growth of suckers may indicate that the Winter pruning was too close, in which case the pruner must use judgment in leaving sufficient to provide more spurs for the next year, and to encourage the vine development.

Generally it is safe to remove all suckers that grow below the head of the vine as soon as is practicable; those from below the surface should come out without delay, while they are soft and succulent, so as to avoid future trouble from the development of sprouting spots and spurs. On young vines suckers start from the roots from the undeveloped eyes on the original cuttings; if these are promptly removed, future trouble will be saved.

The French call all young growing shoots *pampres*; removing them, *epamprage*. This latter term covers more meaning than our term suckering, including also that of removing new shoots from the spurs or long canes left in Winter pruning for the crop. Sometimes the vigor of vegetation is sufficient to force more than one shoot from a single bud, each bud containing four eyes; these extra shoots should be suppressed, the workman using his judgment in selecting the one to remain.

Where there are more than two buds left to a spur, those shoots which are wholly or comparatively infertile and not needed for the next Winter's pruning should be taken off. There may be exceptions to this rule where redundant vegetation is feared. Whenever possible the shoot at or near the base of the spur should be preserved for the next year's spur. Careful comparisons of results in selecting the spur shoot may demonstrate different rules for different varieties of vines.

Some French writers use the word *bourgeon* for *pampre*, and *ebourgeonage* for *epamprage*. In that they are not technically correct.

Disbudding or Ebourgeonage.—Whenever it is known that certain buds on the fruit spur, or cane, do not produce fruit, they should be rubbed off as fast as they develop, unless it is desirable to retard the development of the true fruit buds; care will be taken in preserving the bud which is needed for the next crop. Whenever it is necessary to leave more than three buds on a spur, it will generally be because the first three or more are infertile, in which case a waste of vegetation will occur if useless shoots are permitted to grow.

Pinching, or Pincage.—This operation, when referred to in California, I find, is indefinitely understood by many. As soon as the new shoot shows two leaves beyond the last, usually second, sign of fruit, pinching is generally practiced by severing the extremity by the finger nails. In case of vines which have a tendency to rank vegetation, a little more extent may be granted to the shoot, but it should always be pinched (if pinched at all) before the blooming time.

In many cases, where only two buds are left to the spurs, it would be well to pinch the shoots which are not needed for the next year's spur. The effect of the operation is to throw the sap elaborated by the leaves back to the benefit of the fruit, to prevent useless growth of wood, and to stimulate the growth of the shoot intended to produce the crop of the next year. If lateral growths are caused, they should

also be pinched, as soon as three or four leaves appear, to prevent them from robbing the fruit on the fruit shoots and from exhausting the buds for next year's crop. These operations are illustrated by original cuts in this volume and are referred to in later paragraphs.

The rule, in all cases, should be to foster the growth of the shoots for future spurs, or long fruit canes, and to avoid useless vegetation. A vine that has been properly pruned in Winter will have been given all the spurs that its vigor can support, consistent with the proper development of the wood for the next year and the full maturity of the crops, without wasting any of its energies.

Pinching is, however, of comparatively small importance, where not exceeding three buds are left on the spur, unless *coulure* is feared or early and handsome crops of table or raisin grapes are desired.

Summer Pruning, or Rognage.—Reducing the length of the new shoots, after they have become firm in woody tissue, and after the blooming season has passed, is called Summer pruning here, by the French *rognage*.

This operation sometimes may have a valid excuse; but it is often, and especially in this State, grossly abused.

Wherever there has been neglect in the proper pinching of the fruit-bearing shoots and laterals, as explained before, Summer pruning should be practiced.

Wherever there is a disposition to continue vegetation too late in the Fall, the shoots preserved and encouraged for the next year's wood may be shortened a little at the top with advantage; but this work should not be suffered before the August cessation in the rapid flow of sap. At that time, or later, it may be determined whether the operation is necessary. Early Summer pruning checks the development of the vine, and forces the sap into the laterals, which latter result should be avoided, especially on the wood that will bear the next year's crop.

If the grower cannot distinguish between the shoots needed for next year's wood and those that may be pinched, he had better let his vines grow at will, and satisfy himself with suckering and the removal of infertile shoots. I cannot use words, proper for this volume, strong enough to express my condemnation of the reckless manner in which many vine-growers in this State practice Summer pruning. I will refer to this subject again in connection with long pruning, and in explaining Figures 11 and 13.

Let it be well understood that the shoot, which makes the cane, at the base of which will be found the short spur, or long fruit cane, as the case may be, for the next year, should be permitted to grow freely, if possible trained perpendicularly, and no laterals should be permitted to develop from that part which is to be used for the next crop. The laterals should never be torn off; they should be pinched when they are only a few inches in length, the fruit eye from which they spring having already been developed, thereby diminishing the chances for the next year's crop; the few leaves permitted to remain will assist in nourishing and preserving the remaining fruitful eye in the bud at the base.

The goblet system of pruning is well adapted to all such fertile vines as the *Zinfandel*, *Charbono*, *Mataro*, *Grenache*, *Carignan*, *Black Prince*, *Mission*, *Blaue Elbling*, *Golden Chasselas*, *Burger*, *Folle Blanche*, *Colombar*, *West's White Prolific*, *Orleans Riesling*, *Crabb's Black Bur-*

gundy, *Flame Tokay*, and many others of like habits. It is not, however, suited to the culture of many noble varieties, such as the *Riesling* (*Johannisberg* or *Franken*), *Pinot* (Burgundy varieties), *Malbeck*, *Cabernet* (*Sauvignon* or *franc*), *Chauché* (*noir* or *gris*), *Trousseau*, *Petite Syrah*, *Sultana*, *Emperor*, and other most desirable stocks.

This system, as modified for long pruning, may be practiced as illustrated by Figure 12, the long canes being fastened together over the center of the vine, and short spurs left at their base to provide wood for the next year. The short spur at the base should not have more than two buds; one bud only would generally produce the best results. The long canes should be placed on the different arms on alternate years. The short spurs on the arms, without long canes, should be pruned to two or more buds, according to the variety of vine, so as to produce at least one good shoot with fruit and two good canes for the next year's pruning. In order that the long cane for the next year may be developed sufficiently, all useless shoots should be suppressed or pinched. The short spur should be taken from a well situated cane nearest to the base, in order to avoid too rapid an extension of the arm.

The chief defect in applying long pruning to the goblet system is in the impracticability of distinguishing between the proper shoots for pinching and Summer pruning and those that must be fostered in growth, so that, by permitting full development, the waste of vegetation must be provided for by giving the vine a less number of fruit buds than it is otherwise capable of developing; the fruit canes will become tangled, sun and air excluded, and picking the crop will be more expensive. The long canes must also be taken from wood that has grown at random, and which, unless a high stake to train them to has been added, will have a great tendency to waste their strength in laterals.

Sometimes long canes are taken and passed around the vine, being fastened to the arms. This plan, however, adds only the advantage of better support for the fruit.

For certain white varieties, such as the *Riesling* and *Sultana*, where the land is rich and the maturity not retarded, the head of the goblet form might be carried high and the arms contracted, so that the long canes for fruit might be brought down and tied to the trunk below the head. In such a case, a very high stake would be required to train up the wood for the next year's crop, while the pinching and Summer pruning may be practiced on the long wood beneath without fear of confusion. This plan would not do for red wine grapes, because there would be unequal ripening and a consequent danger to the color, tannin, and other properties. For the *Folle Blanche*, which does well on long or short wood, when intended for distillation, it would produce good results, but in no case, except where late Spring frosts are feared, would there be any advantage in it over other better systems for long pruning. The *Zinfandel*, if intended for distillation, would do well on this latter plan in such rich soils as those of Fresno, where irrigation is practiced either by sillage or flooding, and where the great heat would develop sufficient saccharine.

For the simple goblet system vines are cultivated successfully in this State from six to eight feet apart each way; the general rule is seven feet. There are some places where planting three and a half feet by seven has been tried, but the vines are still young. It is probable that a superior quality of wine will be the result to compensate for extra

labor in cultivation; whether the crop will be larger after the vines are fully developed is not so certain, but it will be so, no doubt, for the first few years of bearing. Generally speaking, vines are planted too far apart in this State, although their vegetation shows increased vigor by so doing; the defect is shown in the impracticability of giving sufficient extension to the arms to carry the full crop that the vines are capable of maturing without too much entanglement. For late ripening varieties, and those which do not develop sufficient sugar in given places, the tendency should be to plant closer than is usual, and so to avoid excessive vegetation.

One objection to the goblet system is that the arms so extend and spread the vegetation that late Spring and early Summer cultivation is generally impracticable. Those who suppose that cultivation by means of horses cannot be practiced unless vines are seven or eight feet apart, should know that the vineyards of the Médoc, near Bordeaux, are planted in rows three feet apart, and are cultivated by oxen, the cultivator sometimes straddling the rows with an ox on each side. But the fruit canes there are fastened in the line of the rows to low slats of wood or wire, and do not spread into the intervening spaces. Not a weed grows in those vineyards, notwithstanding the frequency of Summer rains. In the Sauterne district vines are three feet apart, and the growth is trained up to stakes. Oxen also do the work there, having pieces of hoop fastened from one horn to the other to prevent their points from catching in the vines.

LONG PRUNING.—*Short pruning* may be relatively long or short, as referred to with reference to the number of buds to be left on the spurs. A better term might be that of *spur pruning*, long and short. The term, however, is best understood as meaning that method by which not more than one, two, or at most three shoots, bearing fruit, are required from one spur. The term *long pruning* is properly used, when we refer to methods of obtaining several or many fruit-bearing shoots from one cane, more or less remote from the base. There are varieties of vines which bear large bunches of fruit, but require long pruning, because the buds at the base of the canes are generally infertile, or because all the buds may be irregularly fertile. Such vines must be given long canes, in proportion to their vigor, and all infertile shoots should be suppressed. The *Emperor* is an example. Other vines bear small light bunches, and are, generally, infertile in the first few buds nearest the base. These latter require long pruning in order to procure a profitable crop. Examples of these are the *Trousseau*, *Chauché* (*noir* and *gris*), *Riesling* (*Johannisberg* and *Franken*), *Malbeck*, *Cabernets*, *Pinots*, etc. In giving a vine a long fruit cane, we must consider several things:

First—It must be long enough to accomplish its special purpose.

Second—The long wood must not be excessive, so as to exhaust the vine and prevent the growth of wood for the next year's crop.

Third—It must be considered essentially a fruit-bearing branch, which is to be suppressed the following Winter, to give place to its successor; hence it must not be permitted to waste the strength of the vine in useless vegetation, viz.: its shoots and laterals must be pinched, and its infertile growths suppressed, in accordance with the vigor of the plant and its climatic defenses.

Fourth—In order to bring forth all the fertile buds evenly, and especially to avoid uneven ripening, the long cane must be so treated

as to arrest the flow of the sap towards the extremity, thereby forcing out the intermediate buds.

Fifth—The long cane should be so situated as to separate its vegetation from that which is to produce fruit wood for the next year, the latter requiring different treatment, so that unskilled workmen may not be liable to mistakes.

Sixth—In order to provide wood for the next year's crop a short spur of two buds is generally necessary at the base of each long cane, one bud (the lowest) being required to produce the short spur and one (the second) to produce the long cane for the succeeding year.

Seventh—Except in rare instances and in such systems as the *chaintre*, no shoot for future wood should be preserved on the long fruit cane.

Eighth—In order to produce good canes for the future pruning, it will generally be necessary to train the shoots intended for that purpose to a high stake. In case of trellises the framework will provide the necessary supports.

These comprise all the essential principles involved in the methods of long pruning, the *chaintre* system, by reason of its flexible stem, having the least requirements. I reserve consideration of a medium long pruning, which is suitable to the necessities of certain varieties.

In my general discussion of the habits of the vine during vegetation, I have touched sufficiently upon the general principles that govern the flow of sap, and for their many applications in practice refer to Appendices I and II. I shall in this volume comment only upon the peculiar advantages of certain systems, with their modifications, suitable to the demands of viticulture in California.

The reader is referred to Figure 5, and is requested to compare it with the Guyot system. (See Appendix II.)

The practical differences between the system represented by Figure 5 and that of Guyot is in the depression of the long cane below the horizontal line, Guyot's being horizontal, and in the short spur which, in Figure 5, shows only one bud, one shoot being taken up from the long cane. The former principle is discussed in a work by Monsieur Carrière, also by Monsieur Boireau. The defect of taking a shoot up from the fruit branch will be noted further on. The tendency of the sap to flow to the extreme buds is less when the long cane is depressed below the horizontal. By occasional pinching, to control the most vigorous shoots, the crop will be kept in even condition of development and maturity. By adopting the system shown by Figure 5, the wire support required by Guyot may be avoided, the extremity of the long cane being tied down to a small stake, after the Spring cultivation, and when it is rendered flexible by the flow of sap.

The second, or upper wire, required by Guyot, may be generally dispensed with in this climate, for reasons before stated. Its use is intended for the fostering of the green fruit-bearing shoots, to keep them out of the way of Summer cultivation, to expose the fruit to the sun, and to keep it from touching the soil. In this climate the absence of Summer rains renders Summer cultivation less necessary and keeps the surface soil dry and warm, while clear skies and hot suns render shade a benefit here rather than an injury. Exceptions to this rule I have already noted.

It follows, therefore, that we may adopt the Guyot system, or its modification as suggested to California, without the use of wires.

The requirements would be high stakes at the trunks of the vines to train up the wood from the short spurs, and small stakes to fasten the long canes in the line of the rows.

In practice this system would be both economical and facilitate labor. The cost of keeping the shoots from the short spurs carefully tied up and of tying down, pinching, and Summer pruning the long fruit cane, would not be much if any greater than that now incurred where long wood is tied up to the main stake. Early in Winter the long fruit branch would be cut away, and the canes tied to the main stake would be pruned, one short and one long, the latter being left as it grew until plowing and Spring cultivation is over. When the fruit branch is cut away, the small stake could be placed out of the way by setting it down by the side of the main stake, or by fastening to it above. A good plan would be to have a copper wire fastened to the upper end of the small stake, leaving a loose end, which could be quickly twisted about the long cane when it is brought down, and untwisted in Winter. Where late Spring frosts are feared, the cane reserved for the short spur need not be pruned until after the first flow of sap has pushed out the uppermost buds; this may be equally said of the long cane—both may be shortened and left for final pruning until late.

All vines should be pruned, if the work is done early, in anticipation of favorable seasons; if the Spring opens unfavorably after a dry Winter, and weak vegetation is feared, the long cane may be reduced to suit circumstances, or later a number of fruiting shoots may be suppressed, the best being preserved. This latter rule should apply to vines pruned after any system; it would have a tendency to correct the unequal results caused by variable seasons of rainfall. This year, for instance, in many places vines were pruned as they had been during two previous years of comparative drought. The heavy Spring rains induced an excessive vegetation, which, instead of working to the profit of the grower, caused extra labor in suckering, and, with some varieties, *coulure*. Instances of accidental neglect in pruning showed that if more wood had been left on the vines less *coulure* would have happened. The grower must, however, be firm in his determination to reduce his crop, if the season is unpropitious, and not yield weakly to the temptation of preserving fruit, which he knows he cannot mature. Where long pruning is practiced the signs of overloading may be noted even as late as August by the development of the shoots from the short spur. If these are not satisfactorily luxuriant, it is still time to aid them in a measure by reducing the vegetation on the fruit branch, and by careful supervision of the work of suckering, which may have suffered useless shoots to grow.

Figure 6 illustrates the system, represented by Figure 5, with two arms, each being treated alike. In France the practice of planting closer together than we generally do would render the use of two long fruit branches unnecessary. To adapt the system to vines planted seven or eight feet apart, I would advise two arms, each with a long cane and short spur. The same small stake would serve to fasten down the long canes of the two vines on each side in the line of the row. The extreme buds could be suppressed without shortening the branch, whenever the vine is unable to bear the full load. In some cases, such as with the *Trousseau*, *Chauché noir*, *Meunier*, *Riesling*, etc., excessive vigor might be provided for by taking down two long canes on each side, which could be separated a little after

cultivation is concluded in the early Summer. For such vines four arms would be required.

In order not to overtax the strength of young vines, no long canes should be taken down until the fourth year, except in very fertile soil, where extraordinary growth has been obtained. The full length should be modified by great prudence in limiting the number of fruit-bearing shoots, until the vine has arrived at an age of strength. It is best to err on the side of prudence in this respect while the vineyard is young. On the fourth year, unless the vines have made a fine growth, not more than one long cane should be used. The next year the equilibrium may be restored by taking only one long cane again, but from the opposite arm. After that it will be determined whether there is strength to support two arms. If not, the long canes might be taken alternately, as before, and so as to bring two to one small stake, leaving the field clear in alternate spaces for cross cultivation.

Figures 7 and 8 illustrate the Carrière system after removing the fruit branch in early Winter, and the facility with which the field may be plowed and cultivated before the long cane is taken down. Figure 9 illustrates the true Guyot system with double arms.

Guyot's system of taking canes for both the short spur and long cane from the short spur of the preceding year is much the best, because it prevents the arms from spreading. If it were not for this fault the short spur might be dispensed with altogether, as the long cane could be provided for each year by training up the first shoot on the long branch.

Whoever desires to adopt the Bordeaux systems of permanent slats or wires to attach and fasten the long canes to, being satisfied to incur greater expense in first outlay and future cultivation, can do no better than to study the methods explained in Appendix II.

The Cazenave system of a unilateral cordon, supported by a slat or wire, would be very advantageous for even short pruning, in cases where prevailing Summer winds are steady and heavy enough to prevent one side of the vine from proper development, the cordon being stretched in the direction of and with the wind. This application might also be suitable for varieties subject to sunburning, the rows being towards the south, or towards the sun at 2 p. m.—being so arranged that the foliage would shade the fruit from the sun during the time of greatest heat. The same result may be obtained with less cost by planting vines closer together in the rows, and increasing, if necessary, the distance between the latter. For such reasons vines might be planted at distances of four feet by twelve instead of eight by eight. Cross cultivation might then be done early by single horses. Late Spring rains would make a little extra hoeing necessary.

The Cazenave unilateral cordon, with all the appliances explained in Appendix II, would undoubtedly be very favorable for such rank growing vines as the *Emperor*; for such vines tying up the fruiting shoots to the upper wire (or slat if wood is preferred) would no doubt be beneficial. The same might be said of other vigorous growers, which require long pruning and ripen late, but the cordon should be as low as practicable, so as not to elevate the fruit too much.

For quality of product, the nearer the soil, the finer the result. There is less danger of oidium also where the fruit hangs near or rests on the ground; the worst attacks of this disease being on high trained fruit branches. Therefore, in adapting the Guyot, or other

systems, the head of the vine should be started as near the ground as practicable. With the goblet system, this rule cannot be practiced as well as with the Guyot, on account of its rapid spread and the dangers of wounding the branches during cultivation.

Even after the trunk has been raised by reason of successive additions in pruning, the defect of elevation may be much amended by the practice of depressing the long fruit branch. When the elevation is too high the trunk may be lowered after the manner explained under the head of the goblet system.

THE CHAINTRE SYSTEM.—In Appendix I a full description of this system is given. Experiments have been made with it in Algeria, the reports so far received being most favorable. The main advantage, by this plan, is in obtaining profitable crops from vines requiring very long pruning and considerable development, without incurring the great cost of establishing cordons and trellises. For the *Emperor*, *Petite Syrah*, *Isabella*, and other rampant growers, no better system could probably be adopted. For such vines the rows should not be less than twenty-one feet apart, with vines seven feet apart in the other directions. I am quite convinced that the best method of applying the system is in using one arm only and in training that towards the east, or southeast, if practicable. The prevailing Summer winds of the coast counties would have no injurious effect on vines trained in this direction. If the rows of vines run north and south a greater range for convenient training may be gained than where they run east and west; in the former case they may stretch northeasterly, easterly, or southeasterly; in the latter, only northeasterly or southeasterly.

By training at angles of forty-five degrees with the rows, viz.: northeasterly or southeasterly, the latter being generally preferable, the labor of moving the vines to either side to clear the spaces for cross cultivation will be diminished so far as the broad space is concerned, and the strain on the trunk will be measurably less.

The first vineyard to practically demonstrate this system in this State will be that of Mr. Clarence J. Wetmore, near Livermore. He has already laid down some of his vines and will have a large number ready for the purpose next year. My own vines, planted two years ago last Spring, for *chaintres*, are resistant stocks, not yet grafted; I have been awaiting the results of experiments with several noble varieties before determining which to select for grafts. My brother's experiments this year are with the *Zinfandel* and *Charbono*; next year he will lay down *Crabb's*, *Black Burgundy*, and *Lenoir*, and some grafts of *Semillon* and *Sauvignon*. The first experiments have shown that by strictly following the rules laid down in Appendix I (see translation of Mons. A. Vias' manual), nothing is more simple to accomplish. All our doubts concerning the practicability and economy of the system have disappeared. The essential elements of success in establishing the form of the vine being in strictly observing the rules laid down, viz.:

1. Planting so that the new growth shall start at, near, or a little below the surface of the soil, and if possible on the side opposite to the direction in which the *chaintre* is to be trained. A little care in planting will accomplish this, being careful, if using cuttings, to have only one bud above ground and the second near the surface, and encouraging the latter to grow by loosening and hoeing away the

earth. If the lower bud does not start the first year, it can generally be provoked by close pruning of the upper growth the following Winter, and by keeping the soil hoed away until Spring and loose and warm afterwards.

2. Staking with at least six foot stakes (which need not be very heavy) for the second year (unless as in France the location is one where vigorous growth is delayed until the third season); training up two or three of the most vigorous shoots that are placed so as to make the most continuous growth with the main root, no two of which should start from the same bud; thinning out all shoots that appear superfluous or badly placed; and in Summer encouraging the growth of the best shoot by Summer pruning the others.

3. If a satisfactory cane, well placed, five feet in length, when the slender top is pruned away, has not been obtained the second year, close pruning on one of the lowest canes (if possible on the side opposite to the proposed *chaintre*) to a spur of not exceeding two eyes, and repetition of the training of the preceding year.

4. If a satisfactory cane has been produced, careful and clean cutting away of all other new wood and protuberances at the base, shortening the reserved cane to about five feet. In the case of rampant growers, such as the *Emperor*, about six or six and a half feet should be left.

5. Keeping this long cane tied up until after Winter and Spring cultivation is concluded and until the upper buds have fully developed into upright shoots; carefully suppressing all suckers and all buds that start within a distance of three feet from the ground and preserving three only on the top on alternate sides.

6. It might be best, if winds are not violent and the stake is high enough to train up the three new shoots, to permit the vine to remain upright another season, but this is doubtful and requires experiment to prove whether the main stem would not become too rigid and the upper shoots irregular and broken. The practice should no doubt be to lay down the cane as soon as vegetation has been well started and the wood is flexible by reason of the flow of sap. During Winter the canes are brittle and crack or break easily. A small stake may be used to fasten the stem to the ground. We have found that it is not necessary to risk breaking by suddenly bending it at the base so as to cause it to assume a general horizontal position; the weight of the vegetation gradually and soon straightens out the vine. At my brother's vineyard it was sufficient to cut the strings and let the prevailing breezes slowly bend the stem to the ground. He is experimenting this season by leaving the new wood and shoots on the ground without supports of any kind. Experience shows that no matter how violent the west winds may be, they do not disturb the vine on the ground in the least. The foliage, even on young vines, quickly adjusts itself over the fruit and shades it from the sun as completely as could be desired. Small laterals also appear to perform the same service. It may prove true that certain varieties cannot lie with their fruit on the ground without damage, in which case recourse may be had to little props made from forked brush wood, or to simply constructed crotches of two small sticks fastened near their tops by wire.

7. The second year after laying down, I believe it will be best to maintain the principal stem above the ground at least one foot by means of a stake or crotch; it should be firmly fastened. The three

canes of the preceding year should then be shortened a little, according to the promising vigor of the vine; pruned of all laterals, and spread, by placing clods or a little soil upon their extremities; the elevation of the base of these fruit branches will cause the buds near the main stem to develop with most vigor, and so provide long canes for the succeeding year. If this desired result should not be obtained, Summer pruning of the shoots further from the base will remedy the defect. Later in the season, if experience proves it to be necessary, props may be placed under the fruit canes.

As the vines grow older two or more stakes or props may be required to support the main stem.

As to the modifications suggested by Cazenave (see Appendix I), experience and experiment will determine their value. I am inclined now to follow strictly the plan described by M. Vias, as the simplest and best for the long pruned wine varieties.

As a general rule fertile varieties, which bear satisfactorily on the goblet system, should not be trained in *chaintres* unless experiment proves economy and profit.

For the adaptation of the *chaintre* system to short pruning, short arms could be established by means of long canes, on which short spurs could be made the following year at convenient distances. These short spurs could thereafter be pruned so as to preserve their positions, as fixed fruiting arms. In such case, it might be best to keep the main stem and side branches on a level by resting entirely on the ground, or on a movable frame. In Figure 10, of this volume, I have devised an illustration of this possible modification of the *chaintre* system for short pruning, intending it especially as a suggestion to those who cultivate the *Moscatel* (raisin) variety.

Grafted vines would bear the same treatment as others, and old vines may be converted to *chaintres* by staking up a sucker from below the surface; pruning back the second year, while throwing strength into it by Summer pruning the old branches, and laying down after cutting away the old trunk. If desirable to convert a field, planted seven feet by seven, or eight feet by eight, to this system, the alternate rows may be destroyed the second year after laying down the young *chaintres*; in which case the soil occupied by the destroyed vines should be well fertilized and plenty of potash or lime added to correct sourness that may be caused by decaying roots.

The distance to preserve between the rows of *chaintres* must be determined by judgment of the soil and the vigor of the vine. For very rampant vines, I should choose about twenty-one feet, with seven in the rows; for varieties such as the *Pinots*, *Malbeck*, *Cabernets*, and *Rieslings*, I should think fourteen by seven sufficient. There would be little advantage in too short a *chaintre*. The waste of space occupied by the flexible part of the base, on which no growth may be permitted, would be relatively greater as the number of rows increase, and the advantage of increased vigor by reason of greater development would be lost.

The cost of moving the vines to clear alternate spaces for plowing and cultivating, and other extra work, would not be greater, probably not as great, as that of training long pruned varieties by any other intelligent system; the cost of permanent high stakes would be avoided, pruning would be simplified, ripening would be more uniform, and the greatest possible crop would be raised.

Places liable to very late severe frosts and damp soils would probably be better suited by the Guyot system. This, however, is not certain, as the long canes of the *chaintres* serve as a protection against frost by retarding the growth of many of the buds, the extent of the vine retarding too rapid development in Spring, and it being known that the system originated in a country where Summer rains are frequent.

The *oidium* has not been known to attack vines trained in this way. This is probably due to the comparatively slow development of the young shoots, their firmer fibrous texture, and resistant properties. Several hundred acres have been planted in the State for cultivation by this system.

LONG PRUNING AS GENERALLY PRACTICED IN CALIFORNIA.—Figure 13 illustrates long pruning as generally practiced in St. Helena and other parts of California, where the culture of the *Riesling* has set the example. A stout stake is set at the base of the vine, generally six feet in length, being four and a half to five feet high when driven firmly. Two or more canes, two to three feet in length, are tied up perpendicularly, and short spurs are provided for future pruning. The whole mass of growing shoots is generally tied together at the top, and, after the fruit is set, the whole bush-like vine is systematically Summer pruned by a slashing motion with a sickle, scythe blade, or long knife. In Figure 13 the appearance after pruning in Winter and Summer is represented.

If it were only intended to procure fruit from a few of the upper buds of long canes, this system might be commended in all, except the indiscriminate slashing Summer pruning, which has no other effect than to force out a multitude of laterals and to increase a density of foliage already too great. Its rational modification would consist in pinching the shoots growing on the long fruit canes and in tying the growth from the short spurs over the top with a fastening to the top of the stake.

Experiment has shown, however, that the *Riesling* and other varieties have sufficient vigor in the same soils to sustain larger crops than are now obtained by this method. The defect is in the imperfect development of all the fruit buds by reason of the upright position of the long canes and the impracticability of adding more wood to the densely crowded mass; also, in the imperfect and irregular ripening of the crops, which are situated at unequal distances from the soil, and result from blooming at irregular times.

The vigor of the *Rieslings* in fresh deep alluvions is capable of sustaining larger crops; hence, in a season like the present one, the excessive Spring vegetation has caused considerable loss by *coulure*, which, however, pinching, before the bloom on the long canes, might have partially or wholly avoided.

A mixed system might be experimented with for these vines in very fertile lands as follows:

Continue with canes two feet long tied up, and take down two long ones, one on each side, and fasten them to small stakes in the lines of the rows after vegetation has well started; and provide a short spur systematically at the base of each long cane. Early in the season, and just before blooming, pinch the extremities of all the shoots on the long canes, reducing those at the top of the vertical ones to within one or two leaves above the last fruit signs; repeat this pinch-

ing as the new buds develop as long as the growth from the short spurs permits them to be easily distinguished; then train up and tie over the top of all the shoots from the short spurs, being careful not to pinch or Summer prune them, but to pinch the laterals on them as they appear. This method would probably require two pickings of the crop; first, the fruit on the horizontal long branches and on the short spurs; second, that on the vertical long canes. Possibly the crop of the short spurs and vertical long canes for economical reasons would have to go together, and the pinching of the latter might make them ripen at about the same time.

A better method would, no doubt, be to carry down two long canes on each side, spreading them when cultivation is over, and to train up, as in the Guyot system, the growth from four short spurs, practicing pinching as heretofore explained. Annular incision or girdling might also be of advantage on the long fruit branches near the main trunk.

The mixed plan would possibly work well for the *Trousseau*, which is very vigorous in such places as Fresno and Riverside, and the Cache Creek alluvions. If there should be a marked degree of difference in the sugar percentage of the low-trained and vertical canes, the crop of the former might be reserved for sweet and that of the latter for dry wine. The same might be said of the *Sultana* in very fertile soils; the horizontal canes probably producing the best fruit for drying.

The climate of Napa is not sufficiently warm and dry to insure ripening in good season of fruit too much elevated. As heretofore explained, the evaporating power of the atmosphere has much to do with the perfection of sap and the creation of sugar; the vexed question of appropriate climates must not be determined by temperature alone. The records of the hygrometer should be compared with those of the thermometer, and the relative velocity of prevailing winds should be noted; then make due allowance for the moisture in the soil before and during vintage time.

The methods of pruning, as well as the selection of varieties, must depend on intelligent consideration of these conditions; the quality of products will vary with intelligent culture, as it is now doing in Italy, where the irrational practice of training vines up to trees has been so much practiced, and thin, acid, and poorly keeping wines have been common.

PRUNING AND TRAINING IN THEIR RELATIONS TO COULURE.—This topic will be discussed in connection with that of the *Moscatel* (*gordo blanco*), under the head of Ampelography.

FERTILIZING AND AMENDING THE SOIL.—For general information concerning the renewal of fertility in the soil, and amendments to correct physical and chemical defects, reference is made to the manual of Professor Foëx, translated for my first annual report.

As a partial guide to the consideration of the nature of fertilizers that may be required to preserve the fertility of a vineyard, I will abbreviate the discussion of analyses of ashes, made by Monsieur Boussingault, as follows:

The crop of grapes (small, relatively, as compared with average California crops), together with the canes removed in pruning, was found to have extracted from the soil (reducing estimates to acres),

for each acre: potash, 16.42 pounds; soda, 0.15 pounds; lime, 12.49 pounds; magnesia, 3.24 pounds; phosphoric acid, 7.23 pounds; sulphuric acid, 1.93 pounds. This, compared with other cultures, shows that the vine does not so rapidly exhaust the soil; but it indicates, comparatively, the kind of fertilizers required.

In certain dry calcareous soils in the arid parts of France woolen rags are favorites to promote vegetation. Suint, or wool dust, which may be obtained in California, containing about twenty-five per cent of wool and twelve per cent of oils, with soluble potash and phosphates, would be a most valuable material for such uses. The wool decomposes slowly and reserves its fertilizing power for several years, furnishing ammonia as well as other plant food. It has been tried with success during the last season in loose dry and exhausted soil in the Sierra foothills.

Vine-growers should make efforts to save the wood ashes and bones from cities and villages, utilizing spare time and otherwise empty wagons in bringing them to the vineyard.

The addition of washed gravel to the surface soils of certain alluvial lands, where *Moscateles* and other varieties fail to ripen well, would assist in remedying the defect.

Sand may be used to improve heavy clays and clay to improve very light sand. Carbonate of lime will sweeten sour land. Gypsum will release natural ingredients of the soil for plant assimilation, and will render inert alkali, such as carbonate of soda (see Bulletins of Professor Hilgard).

Stable manure for this climate should be completely rotted before going to the vineyard. The pomace from the wine press should be treated with lime to neutralize acidity, which is otherwise hurtful to the vines. Returning the pomace and canes to the soil, very little exhaustion will be caused by the abstraction of the grape juice.

Some interesting investigations have been made into the fertilizing agency of the annual rainfalls and sea mists, which partly explain the fertility of vines in soils that show to chemistry low percentages of plant food, and where fertilization is irregularly or not at all practiced.

Rain water is not pure, but, on the contrary, leaves a residue after evaporation, which has been found to contain chlorides of sodium and potassium, and sulphates of soda, potash, lime, and magnesia, ammoniacal salts, etc. In France, it has been found that one million pounds of rain water yield almost twenty-five pounds of solid matter. The average rainfall in France, being about twenty-four inches, it is estimated that an acre receives therefrom one hundred and fifty pounds of this residue. It is probable that this proportion of fertilizing material in rain water is not the same everywhere; it has been shown that it varies in the same places at different times of the year. It would be interesting in California to know to what extent our lands may be benefited in this way; the variations of the quality of rain water may have an influence in France, during the Summer especially, in determining the quality of products of different sections. It appears that in respect to potash, at least, the fertilization from rain water is not sufficient to restore losses sustained by the soil from the crops that are harvested.

M. Barral has shown that the rain water of Paris adds to the soil at least thirty-one pounds of nitrogenous matter annually per acre. It is admitted that the sea breezes bring to the vineyards of Bordeaux a considerable quantity of alkaline salts to repair the waste of culture.

This discussion assists in determining the value of deep plowing before planting, and the superior value for viticulture of loose, friable soils, easy of penetration; also the alkaline deposits in certain low depressions, where rain water gathers and evaporates without penetrating the soil to a considerable depth, such places being apparently hostile to vegetation by excess of soluble matters, which rapidly disappear after deep plowing and leaching by surface drainage.

The restitution to the soil of its mineral constituents appears to be of more importance than the supply of organic matter, for the plant may supply itself with carbon, oxygen, nitrogen, and hydrogen from the atmosphere, and, under the influence of light and heat, elaborate the organic food it requires within its sap. Sterility of soil is more due to the loss of the mineral necessities than to the absence of humus. The facility with which the vine may supply its necessities in part from the air, especially where there is plenty of light and heat, will explain why an excess of humus in the soil disturbs the albuminous proportions of the sap, as elaborated and condensed in the fruit, and shown in the troublesome wines of such places. The wines that are most durable and least liable to alterations and diseases from excess of albumen and mucilage, are those from soils which are not excessively rich in humus, nor subjected to extraordinarily luxuriant vegetation under the influence of heat, light, and abundant moisture during the Summer season.

Theories for the guidance of fertilizing may be constructed from these principles. Where rainfall is light and vegetation is not vigorous, organic fertilizers should be prudently used; where moisture and heat stimulate vegetation in soils weak in potash and other minerals, organic matter should be generally avoided and minerals freely given, if circumstances indicate the necessity. Deep plowing, when preparing land, will permit the descent of organic matter to the region of moisture in lands subject to dry seasons, where it may become dissolved for plant use. This also will indicate a rule for turning under the top soil, annually, a certain convenient depth, deeper in arid regions than in those that are relatively humid.

Fertilization with organic matter, in light, loose, gravelly lands, where the *Moscatel* vine does not sufficiently elaborate its sap to perfect and set its first crop of fruit, appears, also, to be indicated as a partial remedy for blight in the bloom. An annual application of superphosphates, suint, together with sulphate of iron, would probably be more than compensated for, provided it be applied immediately before the first plowing and well turned under. The same application would not be required for richer and more compact soils.

Where irrigation is practiced in fine alluvions under the influence of great heat, the vine in this state shows extraordinary results of fruitfulness and precocity. It is most probable, however, that, in order to maintain proper proportions in the constituents of the sap for such large products, careful fertilizing must soon be commenced. In such cases bones and wood ashes would probably give the best results; there may be need in some places of soda, magnesia, iron, and soluble silica, sulphates, and chlorides. Where the rainfall is light, as in Fresno, this may be still more worth consideration.

The experiment, before referred to, of comparing vines in the same land and under the same influences of climate, showed equal development of sugar and acid, but, with increase of moisture, was found

a decrease in other elements of the fruit. Sugar and fruit acid may be formed in the vine from the constituents of the atmosphere, but the dilution of the moisture that feeds the roots seems to cause poverty in the sap of minerals for combination with the organic compounds—the subacid principles are wanting, the fruit is insipid, and the wine is thin and lacks quality. It appears rational, therefore, that where large crops are produced from moist land under influence of much light and heat, that the mineral solutions supplied to the roots should be enriched, and it may be that the keeping qualities of shipping fruit will be improved thereby.

ILLUSTRATIONS.—Figures 1, 2, 3, and 4, are intended to illustrate the discussion of the *Muscatel* variety further on.

Figures 5 to 10 inclusive, 12, 13, and 16, have been explained in preceding paragraphs.

Figure 11 is intended to demonstrate errors in careless Summer pruning, and the relative positions of first, second, and third crops. At the point A the principal shoot was Summer pruned; B indicates the first crop on the main shoot; C shows the second crop hanging from the lateral forced from the main shoot; D shows the third crop on a second series of lateral growth; E indicates the point where the main shoot may be pruned for the formation of a fruit-bearing spur, the lateral beneath being cut away. The development of the lateral growths illustrates how great a drain has been made upon the main shoot and the bud for next year's crop, which lies at the base of the lateral.

Figure 4 illustrates the development of a fruit spur of two buds, the upper shoot pinched at c, and the laterals of both at d; B indicates the point for pruning away the old wood and useless cane; A the point for pruning to establish a new spur. This figure shows the true method for treating the different growths, the shoot from which the new spur is to be taken not being shortened in length but protected from lateral growth, while the other is prevented from wasting the vigor of vegetation and forced to nourish its fruit.

Figure 14 illustrates the different and successive growths of the vine and the proper selection of fruit spurs. The successive growths of four years are indicated. A indicates the point of proper pruning for the selection of a fruit spur growing on wood of the preceding year; B indicates improper pruning, which, with most varieties, would result in a failure of crop; C indicates how the sucker, or *gourmand*, should be pruned, if it is desired to subsequently reduce the length of the arm; the single bud left on it will produce a cane, which can be pruned the next year for a fruit spur.

Figure 15 shows a section of a cane split lengthwise. A shows where it should be cut in pruning, so as to preserve the freshness of the bud below. B shows the point where it is usually cut.

Figure 17 illustrates the "black knot," which may be caused by an interruption in the outlet for the heavy flow of sap in Spring time, but principally by late Spring frosts, which destroy the young shoots, or by early Fall frosts, that destroy the buds on the canes before they are thoroughly ripened. This disease may also appear in like form on the arms, trunk, and roots.

Figures 18, 19, and 20 illustrate the appearances of the common fungoid disease known as *oidium*.

REFERENCES TO ILLUSTRATIONS.

Figures 1, 2, 3, 4, and 10, referred to on page	160 <i>et seq</i>
Figure 4 referred to on page	102
Figure 5 referred to on page	92
Figure 6 referred to on page	93
Figures 7 and 8 referred to on page	94
Figure 9 referred to on page	94
Figure 11 referred to on page	102
Figure 12 referred to on page	90
Figure 13 referred to on page	98
Figure 14 referred to on page	102
Figure 15 referred to on page	102
Figure 16 referred to on page	71
Figure 17 referred to on pages	102 and 165
Figures 18, 19, and 20, referred to on pages	102 and 164

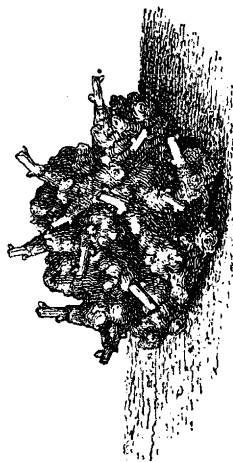


Fig. 1.



Fig. 2.



Fig. 3.

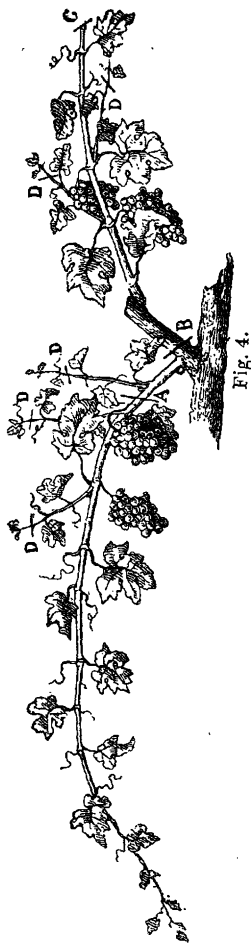


Fig. 4.



Fig. 5.

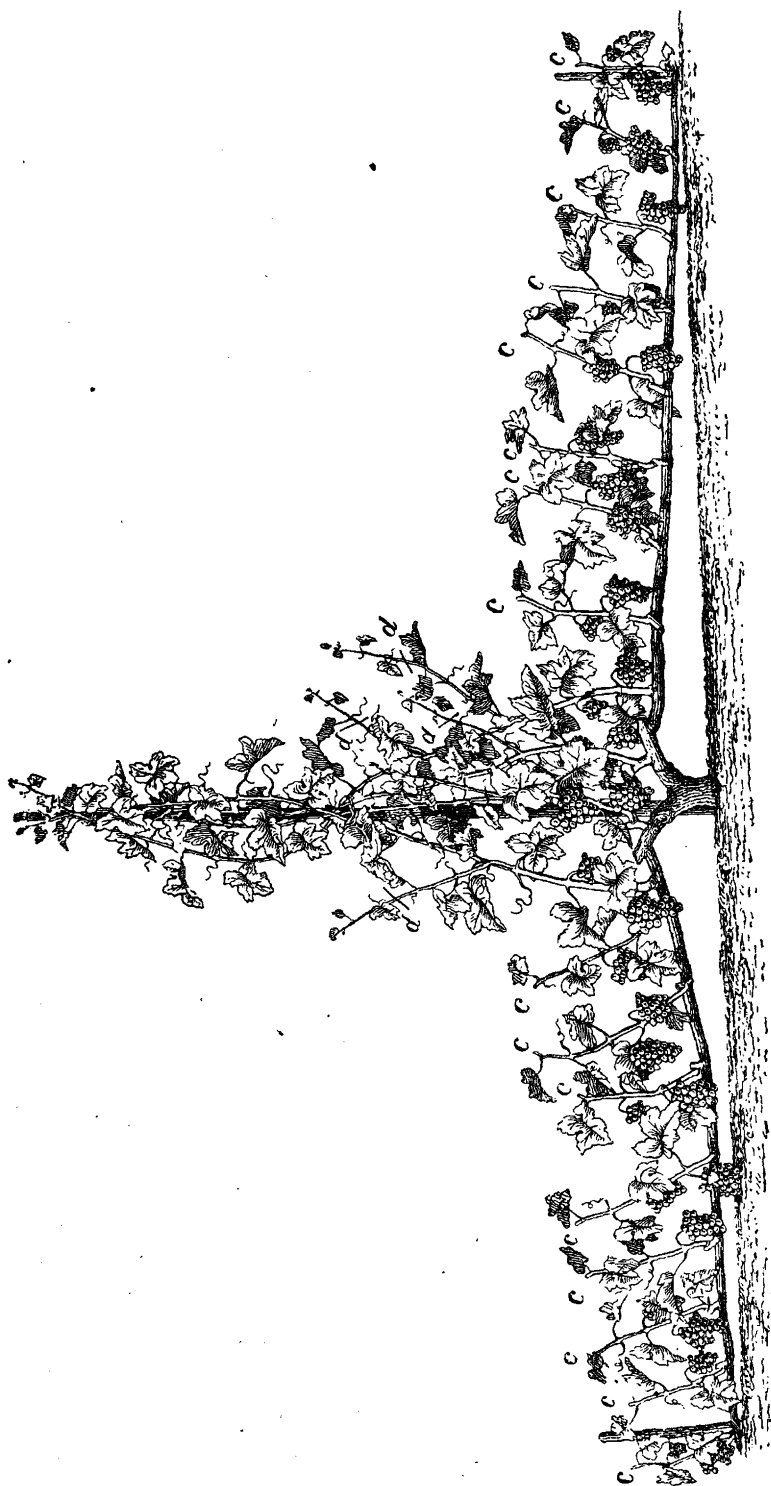


Fig. 6.

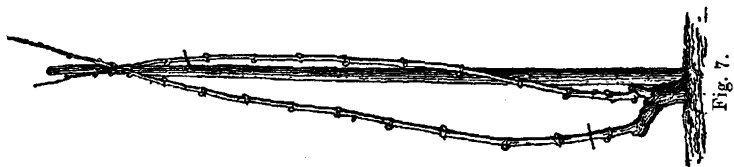


Fig. 7.

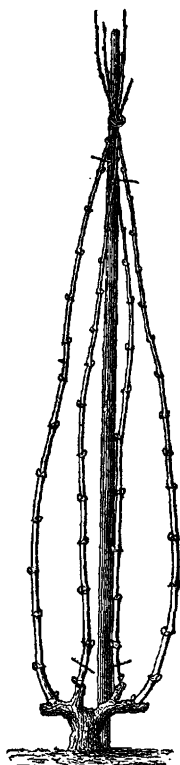


Fig. 8.

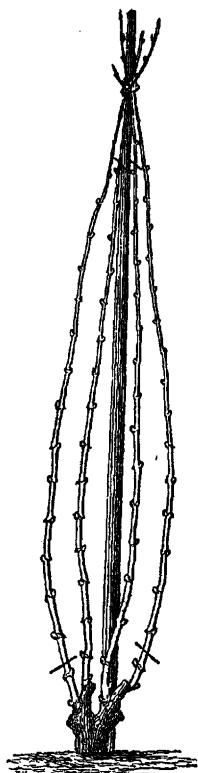


Fig. 9.

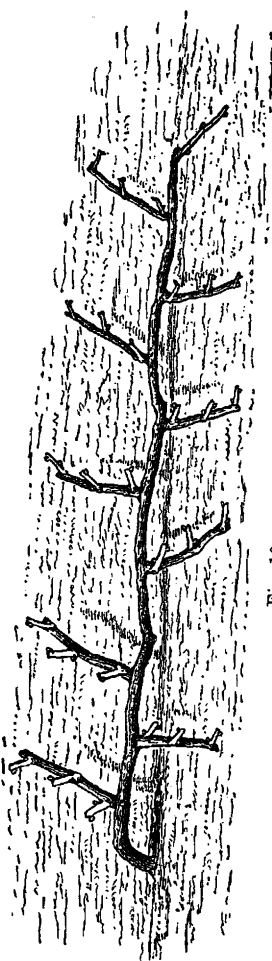


Fig. 10.

PART V.

AMPELOGRAPHY.

BEING PRACTICAL NOTES CONCERNING VARIETIES OF VINES NOW WELL KNOWN IN CALIFORNIA AND REFERENCES TO CERTAIN OTHERS THAT WOULD BE VALUABLE FOR EXTENSIVE PROPAGATION OR PRELIMINARY EXPERIMENT.

AMPELOGRAPHY.—As we have taken our terms relating to the arts from the Latin and often by borrowing them directly from the French, already coined, so also our language is enriched by scientific terms compounded or modified from the Greek. Viticulture, viniculture, and vinification are borrowed from the French, without change, as they were made from the Latin originally, the words *vitis* meaning vine and *vinum* wine, controlling the significations. In like manner we have appropriated the words agriculture, horticulture, floriculture, sericulture, arboriculture, pisciculture, etc.

We now need a word to designate a distinct branch of botany, descriptive and economic, which relates to the vine. The French use the word *ampelographie*, as they do *géographie*, *géologie*, *théologie*, etc., which latter we have already borrowed, changing only the orthography of the terminal syllable. We may with equal right use the word *ampelography*, derived from the original Greek *ampelos*, the vine, and *graphie*, writing or description. The next editions of our dictionaries should give places to viticulture, viniculture, vinification, and *ampelography*.

NOTES ON THE VARIETIES OF VINES NOW WELL KNOWN IN CALIFORNIA.—Early last Winter the correspondence of my office became practically choked by the numerous applications for information concerning the varieties of vines that might be obtained for new plantations, and for grafting old vineyards and young resistant stocks, together with the demands for advice with respect to selections that should be made. The study of these questions is yet in its infancy, and, although I have devoted more time to it than to any other part of my work, it is often very embarrassing to be called upon, in a brief letter, to convey such information as may be necessary to guide the planter within the light of our present knowledge and experience. I, therefore, attempted, as briefly and concisely as possible, to prepare notes, comprising practical results of study and local experience, sufficiently extensive to serve as a basis on which to conduct further researches and amendments, intending to incorporate the same, with whatever changes and additions might appear proper, in this volume.

The studies of this and succeeding years will so much enlarge our knowledge in this department of viticulture, that a thorough revision

and further perfection of the work must soon be undertaken. At present I have not the time and opportunity to do more than revise what has already been given to the vine-growers through the public press, without making material changes, and add some matter, relating to varieties not generally known here, which want of time last Winter prevented me from doing. The following is substantially the material prepared, as I have explained:

So much depends on an intimate knowledge of almost infinitely varying conditions of soil and climate, on the purposes, ambitions, and financial ability of planters, on local wants created by plantations already made, and more especially on the resources of our vineyards to furnish cuttings and vines, that I am often conscious of apparent inconsistency in my recommendations. I am often, in the same breath, recommending the cultivation of a certain variety in a certain place and advising the planting of others, knowing, as I may at the time, that the most desirable may not be obtainable, and keeping in mind those that may be equally valuable from other stand-points and at the time within reach of the planter.

The day will no doubt come when certain places will become devoted mainly to the culture of certain varieties, known to produce the best results; but now we can only estimate within certain limits wherein the best average results may be reached, leaving the future to determine where the highest success is achieved. There are so many ways of accomplishing success in viticulture in any locality, that the vine-grower is not confined to any fixed selection of varieties of vines. One may believe that quantity will pay better than quality; one may prefer fair quality with good quantity to either great quantity and poor quality, or the finest quality, regardless of quantity; one may even believe that the finest quality will always be profitable and the safest to pursue, or one may be satisfied that in his locality the finest quality is not attainable and therefore believe that it would be best to compete for cheap prices with large quantity; again, one may think it safer to produce white wine than to produce red; sweet than dry; brandy rather than wine; table or shipping grapes; raisins, etc.; and, indeed, one may prefer to produce raisins, but may find that his locality is best suited to wine grapes, and *vice versa*.

My own line of policy has been to advise planters to aim to produce that quality and type of goods which their particular localities promise to produce best. I have believed that, if ever we do overplant grapevines, or "overdo the business," as is often talked about, it will be in producing inferior qualities of grapes, wines, brandies, or raisins, which the markets will not be ready to take, so long as plenty of better quality is offered. In developing a new industry and opening new markets, we must aim, by the tempting quality of our goods as well as also by cheap prices, especially where we come in contact with adverse customs and prejudice, to achieve success. This State has so much land to develop, that can be made to produce superior quality, that I do not believe this generation will see the day, after we have once produced sufficient to satisfy created demands, when good quality will be suffered to waste, while poor quality is marketed.

I know that at present it pays better, generally, to produce quantity rather than quality, but that has been for several reasons, viz.: wine makers and buyers have not yet well learned where to detect good quality until after they have had the wines stored awhile; the markets have needed all that could be produced; and in most vineyards the

grapes producing finest quality have been drowned beyond recognition in inferior lots. The progress that has been made in the last few years, in experimenting with single varieties of vines, has, however, been very great, and, although not appreciable yet in the general markets, it has served to guide many planters in grafting over old stocks and in making new plantations. This process of improvement has been systematized to such an extent, that, in two or three years more, the market can be supplied with considerable quantities of superior wines and brandies—much finer than any now offered in merchantable lots. Then will commence the true competition among wine and brandy producers, and it is hardly fair to presume that the dealers will fail to secure first, for their cellars, the most desirable goods. Those who fear that the “business may be overdone” should certainly believe that safety is on the side of quality, and danger on the side of inferiority. I myself do believe that the business of making inferior wines, brandies, and raisins, will be overdone, but that good quality will always find a ready market.

If I am right in this proposition, then I have been right in urging on our people the careful study and selection of varieties of vines; not so much with reference to their fertility as with reference to their value in producing certain qualities after fermentation, distillation, or drying. And, as it is known that a certain vine does not produce the same results in all places, and even that where one fails another succeeds, the question of the selection of varieties can only be approximately solved by any process of reasoning in advance of actual experiment. We know, however, certain general rules of climate and the adaptation of vines; something, but not a great deal, about soils; and we know that success is always to be found, if found at all, within certain limits of selection. Advice can therefore be given without too large a margin of doubt. I have always felt my conscience clear when I have told a planter the best that is known, and have always tried to make him understand, whenever he is inexperienced, that his percentages of failure will be less where he plants in accordance with an intelligent theory. This I have always been able to demonstrate by appealing to whatever successes we have attained. Our *Zinfandel* was not propagated by accident, but by the advice of intelligent and experienced wine makers, who recognized in it certain good qualities. It has been of great value to us; yet experience proves it to be a failure in many places. It is by applying theory, together with such experience as is now open to study, that we hope to make more rapid progress and fewer failures in the future. Let the beginner not be dismayed by the chance of failure, such as I refer to; his vines will serve at least as roots to graft upon, when he has determined how to improve his plantings. If he is timid, let him plant varieties of known excellence in situations of known results. If he tries unknown spots, let him try to understand why he selects any particular variety before doing so.

With these remarks I will endeavor to outline the known characteristics and uses of the most prominent varieties of vines that have proved their excellencies and uses in various parts of the State, and afterwards to suggest certain combinations for vineyards in different districts.

THE RHENISH WHITE WINE VARIETIES.

RIESLING.—This is the noble grape *par excellence* of the Rhine, excelling in its aroma. Properly speaking, there is only one true

Riesling, viz.: that which is by courtesy called the *Johannisberg*, after one famous vineyard, where it predominates. Custom has, however, attached the name to other varieties, so that when we wish to speak of this genuine variety, we must now use the word *Johannisberg* to identify it. This is a shy bearer, requires long pruning, and succeeds well only on soil of sufficient moisture and strength. (N. B.—I shall speak of characteristics mainly as they are shown in this State, where climatic conditions are different from those of the native homes of the varieties.) It is an early ripener, otherwise it could not succeed on the Rhine. Experience in Europe shows that it loses its aroma and quality when cultivated in warmer countries and situations, where later ripening varieties come to perfection. On the Rhine the greatest perfection is often obtained only when the berries are left on the vines until long after the usual time of vintage. This should not be the rule here, except under similar circumstances, viz.: where sufficient saccharine is not obtained early. I believe that we shall not succeed in making fine *Riesling* wine of Rhenish type except in such places where over maturity is difficult to obtain, and where at the time of ordinary ripening the must does not exceed twenty-two per cent in sugar. In such places, I believe the excellence of the product will be, as on the Rhine, and as with the varieties used in making Sauternes in France, improved by leaving the fruit as long as possible on the vines. What soils are not suited to the *Riesling* we do not well know; but we do know that this variety is a failure, as to the quality of wine, in the greater number of our wine-producing districts, and it is only popular in the counties north of the Bay of San Francisco and west of the Sacramento Valley. Other districts appear to be too warm or too dry for it. It would probably do well in Santa Cruz and San Mateo Counties, south of the Golden Gate.

SYLVANER, better known as *Franken Riesling*.—This variety is associated on the Rhine with the *Johannisberg* in producing the finest wines. It is a fine wine grape, and, until experience proves the contrary, should be limited to the counties where the *Riesling* is known to make fine wine. This is the variety known as *Green Hungarian* in El Dorado County. The wine made there from it shows its noble origin, but also that it is not in its true home.

TRAMINER.—This variety is also a noble one, but is very little cultivated outside the Sonoma Valley. Not much is therefore known about it. An inferior grape, similar in color, but with longer bunches, is sometimes confounded with the *Traminer* in Napa County. Probably the *Traminer* should be limited to the known *Riesling* districts.

KLEVNER.—This belongs to the *Pinot* family and will be treated under that head.

KLEINBERGER, ELBLING, ALBA, WHITE ELBA.—This variety is the so called common grape of the Rhine, bearing well and making an agreeable light white wine. Its quality is sufficiently high to permit its use in vineyards where the *Riesling* is cultivated, contributing to the blend its own excellencies. I cannot find this grape with certainty except in the Sonoma Valley in small lots. It is the history of this variety that it improves by being moved to a warmer climate. It enters into the composition of French champagne in some degree.

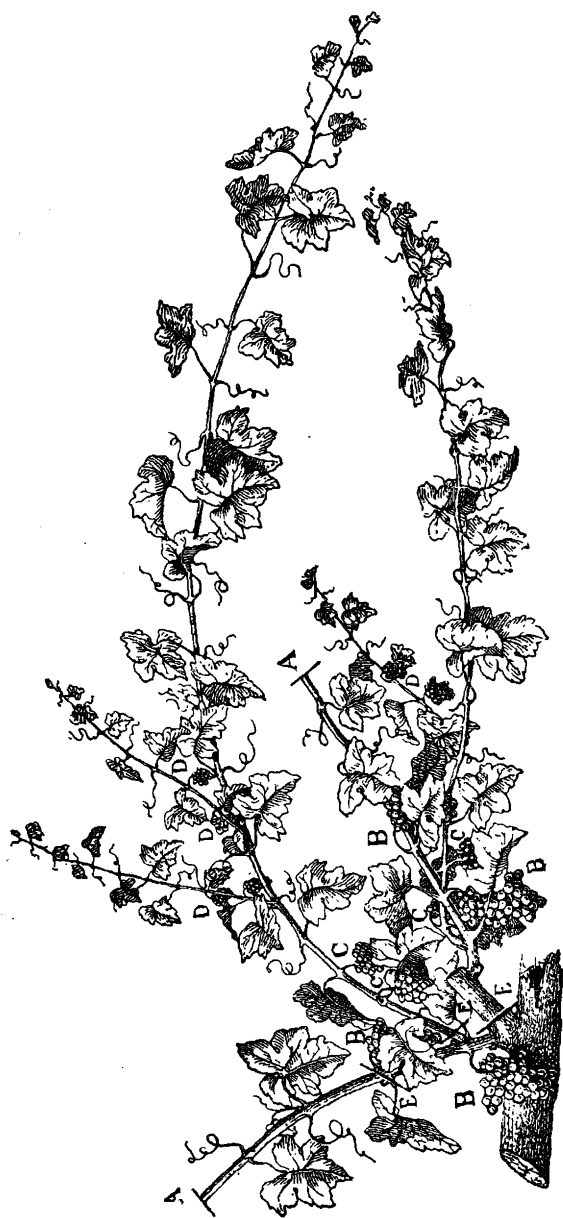


Fig. 11.

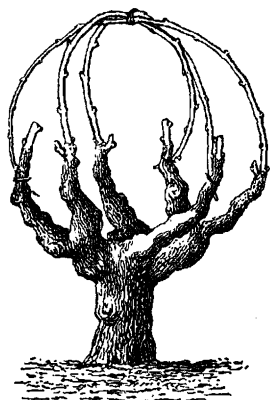


Fig. 12.

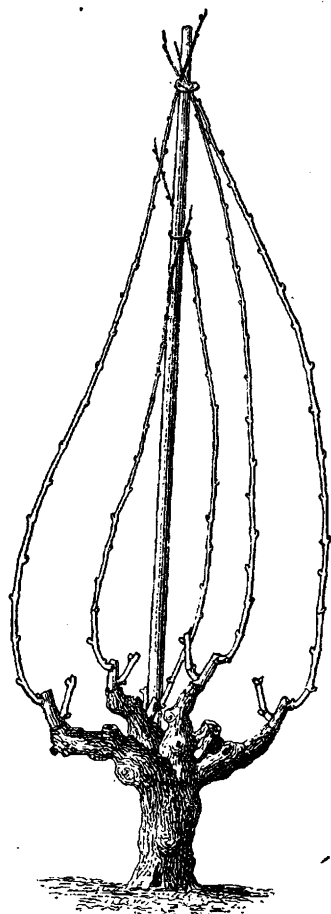


Fig. 13 (a).



Fig. 13 (b).

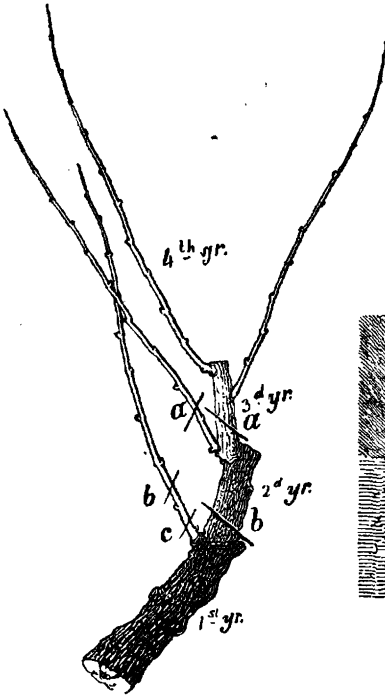


Fig. 14.

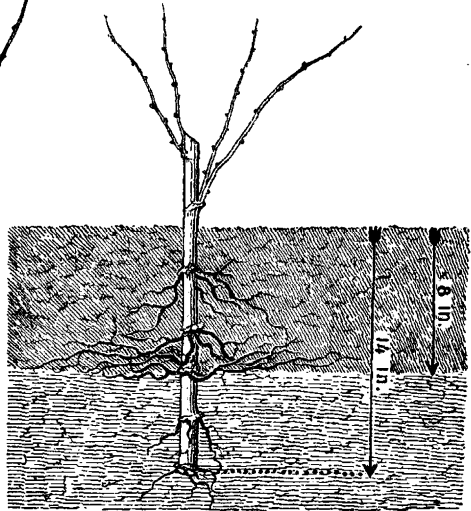


Fig. 16 (a).

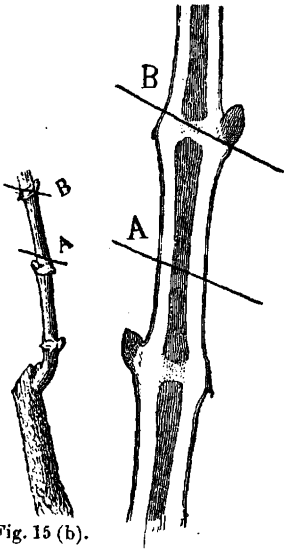


Fig. 15 (b).

Fig. 15 (a).

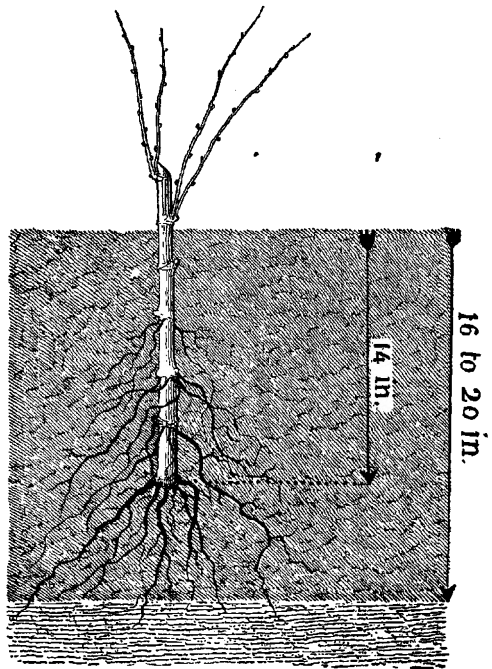


Fig. 16 (b).

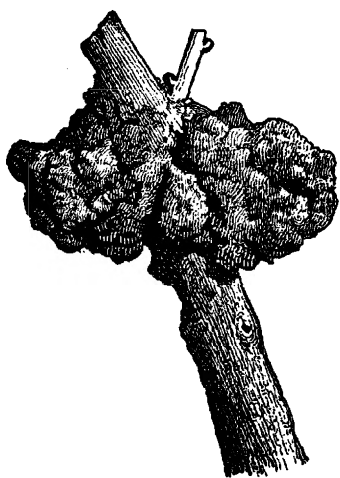


Fig. 17.



Fig. 18.

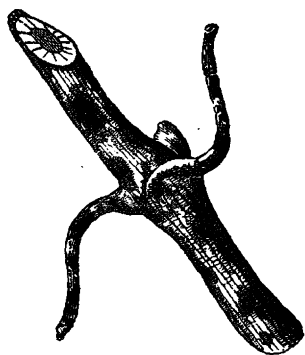


Fig. 19.

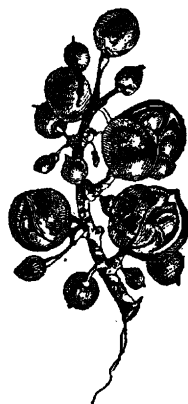


Fig. 20.

Probably this grape ought to be cultivated more in the Sonoma and Napa white wine vineyards. Mr. Dresel, of Sonoma, has a small block of this vine. This is the true *Burger* of the Rhine, though I do not use this name here because we might confound it with another variety known erroneously by that name.

BLAUE ELBA, OR ELBLING.—This is simply a dark-skinned variety of the *Kleinberger*, or *White Elbling* of the Rhine. Rhenish authorities say it is superior in quality to its fairer sister. It makes a very good white wine in Los Angeles County, proving thereby that the authorities are correct in saying that it may be moved to warmer climates without danger. It should be blended with some nobler grape. I believe that in Los Angeles County in places where the *Zinfandel* does not show good color, the latter should be made into white wine and blended with the *Blaue Elbling* and possibly also with the *Burger* (so called), these varieties being sufficiently planted there already.

CHASSELAS.—Under this name are classed a number of varieties, but for wine making only one is prominent, viz.: the *Chasselas Doré*, otherwise known as *Chasselas Fontainbleau* or *Gutedel*. This is the true *Golden Chasselas*; the latter name has been accidentally misapplied in Napa County. In France and on the Rhine, the *Chasselas* is not highly esteemed as a wine grape, on account, particularly, of its low degree of sugar. It is generally used in France as a table grape; in the south of France sometimes for wine, but as such is not highly esteemed. In this State, even in Sonoma and Napa Counties, this grape demonstrates the marked difference of our climate, when compared with that of the home of the Rhenish vines. Here it obtains sufficient sugar to make a good bodied wine, which is highly esteemed by many. I will state it, as a rule that I think will be followed in future, that in proportion as we find the *Chasselas* succeeding in making good wine in any given spot, we shall find the *Riesling* falling behind the standard excellence of the Rhine. The north slopes should be preferred for the *Riesling* and the south slopes for the *Chasselas*, or the *Riesling* may go with advantage to the bottom land and the *Chasselas* to the hillside.

GOLDEN CHASSELAS (so called).—This variety, well known in Napa County, is, without doubt, accidentally misnamed. It is so well known, however, that it will be with difficulty changed to another name. What its true name is I do not know. Mr. Morel thinks it is the French *Roussanne*, but I am inclined to believe that it is one of the many Spanish varieties, which are little known, and which might easily have been sent here mixed with *Chasselas*, or accidentally mislabeled. It is a very vigorous and fertile vine, best known in the vicinity of St. Helena, and would, no doubt, bear planting in places where even more generous wines are produced. It makes good white wine, but not of very high promise unless blended.

MOSELLE RIESLING.—I have found this excellent variety only in San Joaquin County. It is very much needed in the *Riesling* vineyards of Napa and Sonoma to impart its characteristic acids and aroma to blends of the *Johannisberg* and *Franken*. It is, I believe, a better bearer than the last two named. When distilled in Stockton

with the *White Prolific* it assists in making fine brandy. On the Rhine it is called also the *Klein-Rauschling*. It should not be neglected. (N. B.—Since writing the foregoing I have found the true variety in recently imported collections of Mr. H. W. Crabb and the Natoma Company.)

OTHER GERMAN VARIETIES.

MALVASIER.—Known also here as *Black Malvasia*, *Malvoisie*, etc. This is no true *Malvoisie*, but came to this country under the name of the *Malvoisie Noir de Berlin*. This I am told in Santa Clara County. It is probably a German grape of the *Trollinger* family, of which our

BLACK HAMBURG is a representative. Both these varieties are properly only selected for the table. The dry red wine of the *Malvasier* is disliked by the dealers; some claim to make excellent port wine with it, but the standard of taste for port has not been high, and it has only been compared with *Mission* port. I believe it may be serviceable for port wine, but will need other and finer varieties to improve it by blending.

GERMAN MUSCATELLER.—This variety is different from the French *Frontignan*, or *Muscat Blanc*. It is useful in very small proportions in blending with almost neutral white wines to give a slight aroma. The Schramsberg leading wine is a light *Burger* slightly flavored with *Muscatteller*.

MISCELLANEOUS.—The *Big Riesling*, the *Frontignac*, the *long green*, and others less known, are varieties now receiving attention and study; also many varieties of *Chasselas*.

OTHER WHITE WINE VARIETIES.

Only the Rhenish white wine varieties are well represented and studied in this State. The noblest French and Spanish are scarcely known, which is to be regretted, as we are thereby prevented at present from reproducing the Sauterne and Sherry types. The Burgundy types of white wine are represented only experimentally. We have, however, in considerable quantities, the following varieties of interest, and already distributed in several parts of the State:

BURGER.—This variety, now so well known, is evidently misnamed. How such accidents of nomenclature could happen might easily be explained to any one who has ever attempted to introduce and propagate foreign varieties of vines; the accident is apt to happen in the vineyard in Europe, where the cuttings are made, through the mistake of some workman; it is apt to happen through similar mistakes in nurseries here; and we even find that we are in danger everywhere of carelessly adopting the names which European workmen erroneously give to varieties which they find growing here, and which they think they recognize. Many of our most important stocks of vines are now passing in this State under names which have been given to them by French or German workmen after they have been grown here for years. For instance, Mr. Charles Lefranc will tell you that he had great trouble with his importations, made about twenty-

five years ago, the time in transport being long, and labels often being rotted off before their arrival. Thus he had cultivated the *Grenache* for a long time without knowing its name, when accidentally he fell upon a workman from the south of France who recognized it. Such recognitions are, however, generally to be distrusted. I have found by experience that very few French or German workmen have even a faint idea of the great number of varieties of vines that are known outside the districts they once worked in, and very often they imagine that they are acquainted with all important ones; so they will generally attempt to identify in every variety that they find here some one variety that they knew in their native homes. It is very difficult now to trace back the origin of many of our well known varieties, and some of them are nearly hopelessly lost to history, as, for instance, the *Black Prince* or *Rose of Peru*, the *Feher Szagos*, *White Nice*, *Emperor*, *Petit Pinot* or *Crabb's Black Burgundy*, *West's White Prolific*, and more especially our popular *Zinfandel*. Those who imported vines between the years 1850 and 1860, exchanged with each other without preserving records of origin; and nearly all the public spirited men who promoted this great work are now dead, without leaving records of their own importations. The great collections of Colonel Agoston Haraszthy were made up of a large number of varieties, collected from all sources in this State, and supplemented by his most valuable importation during his studies in Europe, while traveling as the Commissioner for California. We cannot tell now, from his published catalogue, which varieties he imported himself from the European collections, and which he had gathered from other importers in this State. During his life he distributed hundreds of varieties throughout the State, the greater number of which are lost to name and inextricably mixed up in old vineyards. It is well known that several parties have commenced to form new and authentic collections by direct importations, which will be the means of assisting in future in unraveling many present mysteries. It is possible, however, that in some cases we may forever remain in the dark. We have, no doubt, propagated, in some instances, vines taken from collections in Europe that are almost as little known there as here, rare curiosities of viticulture, which we have utilized; this, I believe, is the truth about our *Emperor*, which I have found, so far, impossible to trace back.

These remarks, suggested by the *Burger*, so called by us, are properly placed here, because this variety is destined to play an important role in our industry.

The *Burger* of the Rhine, as explained before, is, no doubt, the *Kleinburger* or *White Elbling*, and far different from our grape of that name. Our *Burger*, I have no doubt, however, came from the Rhine; yet I have not classed it among the Rhenish varieties, because it does not belong to them. The climate of the Rhine is quite unsuited to bring this vine into proper maturity, except, perhaps, in most favorable situations and years. Its home is in a warmer climate. In the *Ampélographie Rhénane*, among the varieties cultivated on the Rhine, is described the *Grand Tokayer*, which is also called there the *Thalberger*, or *Putscheer*. The history of this variety is that it came from Hungary and that it even is used in the Grand Tokay vineyards, together with the *Furmint*. This statement, however, is doubtful. It was introduced on the Rhine as a curiosity, on account of its extreme fertility, but the Germans were soon forbidden by their

Government to propagate it, for fear the quality of German wine would be injured by its introduction. On the Rhine, as in this State, it was a tempting variety to plant, on account of its great fertility, but there, as even here, in some situations, it would not sufficiently mature its fruit, the climate being unfavorable. From the description of this variety, I inferred at once that our *Burger* was the *Putscheer*, which appears to be the proper name of the *Grand Tokayer*.

The picture of this variety, however, differs from our *Burger*, both in shape of bunch and leaf. While in this confusion, Mr. Groezinger, of Yountville, imported the *Putscheer* from the Rhine. He succeeded in fruiting about ten vines, among which all but two were identical with our *Burger*, and two were identical with the illustrated plate in the *Ampélographie Rhénane*. Now, we are left to think several things: either that our *Burger* is the *Putscheer* and that the artist made an error in his illustration, or that what is known as *Putscheer* really comprises two varieties of similar characteristics; but the evidence points certainly to Hungary as the native home of our *Burger*. Such an opinion accords with its character, for here we find it ripening its fruit to perfection only in most favored situations.

I believe that it is destined, together with small proportions of more aromatic varieties, to make the white wines of California as celebrated as the light table wines of the Rhine. With this variety as a base for blending, an agreeable, wholesome, light white wine can be made in all viticultural sections of the State where it can be well ripened.

In the northern bay counties it should always be confined to the warmest exposures, and should never be planted on rich moist bottom lands. In Santa Cruz County and in similar places, where the proximity to the sea tends to reduce the saccharine of grapes, the *Burger* may be unsuccessful except in the most favored spots, on rocky or gravelly soil.

In Fresno County and along the hot foothills of the Sierras, I believe that if this grape will stand the excessive heats of the Summers it may be used to produce a wine of Manzanilla sherry type, provided the fruit is allowed to attain all the maturity possible. At least it will be useful, I shall confidently predict, for such purpose, if blended with true sherry varieties from Spain.

In Southern California, Los Angeles, San Diego, etc., it promises to form the basis of light white wines. This I state while knowing that it has apparently failed in Anaheim for two years, the leaves dropping and exposing the fruit during the hot spells. I say *apparently*, because I do not believe that this accident is to be a permanent one; at least I believe that it is—a question of soil rather than climate in Los Angeles County.

The hot spells of Napa County are certainly more severe than those of Southern California. I will venture to say that the trouble at Anaheim with this grape was due to a sandy soil, not retaining moisture during the Summer, and that the *Burger* will succeed, like the *Zinfandel*, if not suffered to over-bear, on soils or subsoils where there is a sufficiency of clay and red oxide of iron.

The wine from the *Burger* is generally called neutral, and is valued by the merchants to blend with heavy or aromatic wines. It will, no doubt, play an important part hereafter in blending with heavy red wines, to reduce the strength and to add life to their dull characters.

I shall hereafter call attention to two important characteristics that we must seek for the bulk of our wine grapes, viz.: wholesomeness and transportability. The latter characteristic every wine maker knows, means also easy fermentation.

The must of the *Burger* ferments easily and the wine keeps well. Hence it will be used to some extent in many vineyards where fermentation is difficult, even in combination with black as well as with white grapes. The *Burger* and the *Mataro* are to prove the chief safety valves of fermentation in California and the hoops of our wine trade. Let it be understood generally that a poorly fermented wine is unwholesome; that wines of difficult fermentation cannot be safely handled nor consumed when young; that wines easily fermented and good keepers are the known wholesome wines; that a great wine trade can only be built upon a reputation for wholesomeness and small risks to the merchant, and the public will understand why I have encouraged the planting of varieties known to produce salutary rather than fancy wines. The so called noble varieties in some cases are not easy to ferment, and do not always produce wholesome wine; but their true office should be to be blended in fermentation with more useful plain varieties, to add character and beauty to the vintage. In the vat the *Mataro* and the *Burger* will correct the defects of fermentation of many other varieties, will render unwholesome musts wholesome, and save the merchant from handling rebellious new wines.

For making fine brandy I believe the *Burger* is also destined to play another important role. In many respects it resembles the *Folle Blanche*, which is the leading grape of the Cognac country. I believe that they are of one family. If I had a vineyard such as some of those in the bottom lands of St. Helena, where ten to twenty tons of grapes to the acre is not an uncommon yield, and where the quality of the wine is often very poor, I should plant *Burger*, *Folle Blanche*, and *Colombar*—producing thereby a large crop of very light greenish white wine, which I would carefully distill, fully believing that the brandy I should make could only be surpassed in quality by the same method in some other similar place, where perhaps there may be more calcareous matter in the soil. If we are ever to make a fine reproduction of the highest type of Cognac, such as was exhibited at our last State Viticultural Convention, the type of which is known as *Grand Fine Champagne*, we must certainly do it after the manner I have indicated. Whatever of delicacy there is in the Naglee brandy is, no doubt, due to the rankness of the vegetation of the maker's vines, the lightness of his wines and their comparative immaturity, together with a certain fair proportion of quality in the grapes themselves. On the same land the *Burger*, *Folle Blanche*, and *Colombar* would have made Naglee brandy, I firmly believe, immensely superior to what it is now. *West's White Prolific*, as a brandy grape, I shall discuss by itself. I believe it is a variety of the *Colombar* family.

Let some one in Napa County try this experiment next year. Mr. Crabb is the man to do it: Take some valley *Burgers* from the bottom land, with sixteen per cent sugar; send for some *Folle Blanche* from Alameda or Santa Clara County, with instructions to pick at not exceeding twenty per cent sugar; send also for some *Colombar* of twenty to twenty-four per cent sugar; ferment, without pressing the skin too much, and distil immediately after fermentation at low

temperature; and then let the public note the result from year to year as the brandy improves—being careful to keep it in proper coo-
 perage of not more than one hundred and fifty gallons in size, and
 changing coo- perage every two years for new wood. See what can be
 done this year by a distillate from such light *Burger*, *Colombar* (*White
 Green Riesling*), and *Folle Blanche* wines as can be found to experi-
 ment with.

COLOMBAR.—This variety came under its true name to Mr. Pellier,
 of Santa Clara County, from the Charente district in France. It is
 one of the celebrated Cognac varieties, cultivated with the *Folle
 Blanche* and *St. Pierre* in all the finest Cognac growths. Mr. Lefranc
 has it under the name of *Sauvignon Vert*, and for some time it was
 supposed to be the *Sauvignon* of the high-classed Sauterne vineyards.
 This latter supposition has been proved a mistake, both by compar-
 ing the vine with the true *Sauvignon* recently imported in experi-
 mental lots, and by the study of the wine. Mr. Lefranc's white wine
 owes its Sauterne character, no doubt, to the mixture of the *Colombar*
 with other varieties, not yet clearly known to the public. It is not
 improbable that in some part near Bordeaux, the *Colombar* may be
 known as the *Sauvignon Vert*; the Charente, or Cognac country, and
 the Sauternes are not far apart. Some authorities put the *Colombar*
 as a synonym of the *Semillon* of Sauterne; but comparisons made
 recently disprove this.

The *Colombar* is, however, a known fine variety for white wine,
 both in France and in this State. At St. Helena it acquired acci-
 dentally the name of *White Green Riesling*; then it took on the name
Sauvignon Vert from Mr. Lefranc's collection. I have little doubt in
 saying now that I believe it should only be called the *Colombar*. We
 need the Sauterne varieties, and should not confound their names.

The *Colombar* will, I believe, from all I know of the vine, make a
 fine blend for *Burger* in the interior and southern, as well as in the
 northern counties; a blend that may be improved into a light fine
 Sauterne type, by grafting in as rapidly as possible a certain percent-
 age—say, about one fourth of the true *Sauvignon* of the Sauterne
 country. To obtain a finer reproduction of the Sauterne type, we
 must wait until we have stocks of *Semillon*, *Sauvignon*, and *Muscadelle
 de Bordelais* (*Raisinotte*, *Cadillac*, etc., synonyms).

The *Colombar*, as has been said before, should accompany the
 selections for brandy vineyards, where it is desired to produce the
 Cognac type.

This vine is a fair bearer—sufficiently fertile with short pruning.

FOLLE BLANCHE.—We are indebted to Mr. Pellier's collection, also,
 for the celebrated *Folle Blanche*, of the Charente, which near Cognac
 is the dominant variety. The vine bears abundantly, with close-set
 bunches of white or greenish-yellow (when ripe) grapes. Near
 Cognac it is distilled, because its wine there is so light in alcohol
 (generally six to seven per cent) that it will not keep over the season.
 In the lower Charente and in the Gironde, near Bordeaux, it ripens
 better, and makes a very light wholesome white wine, very much
 liked by German importers. This wine, mixed with that of the
Chalosse, often passes in our market as a cheap Sauterne. Probably
 it has been blended with a small quantity of real Sauterne. The
 quality of the grape for wine appears to improve as it goes south, and

for brandy as it goes north, which, together with other facts, has made me announce this rule, that to make the finest brandies we must distil the lightest white wine from a certain type of grapes, and that a certain degree of immaturity of fruit will result in better brandy.

As a wine grape, however, I believe the *Folle Blanche* is important to us. Unfortunately we have not seen many samples fermented separately in this State. When very young it appears to have an objectionable rawness of flavor; but this passes off within the year. It has fermenting qualities similar to the *Burger*, and for that reason will be valuable to us. Probably there is no other white wine in France that can be handled with so low a degree of alcohol as the wine of this grape. In Bordeaux it is used in preparing what are known as "cargó clarets," which, in fact, comprise the bulk of the Bordeaux wines exported to this country, and which are labeled to suit after they are put on our market. The object of these preparations is to utilize heavy Spanish clarets and those of the Mediterranean coast, made from the *Mataro* (principally), *Grenache*, and *Carignan*; also the dark coloring wines of Cahors, etc., made principally from the *Malbeck* (giving the so called Bordeaux flavor), and the cheap white wines from the *Folle Blanche*. These white wines impart to the other heavy red wines that quality which causes them to be called clarets, and improves them for table use. I believe that the *Folle Blanche* can be made to play the same role in this State, where similar combinations will be much needed; but probably the grape must not be permitted to pass a certain degree of maturity—possibly 18 to 20 per cent of sugar. This is a matter for experiment. Our interior clarets, I believe, will yet be made by blending together with the *Mataro*, *Carignan*, and *Grenache*, a certain portion of highly-coloring grapes, such as *Lenoir*, *Bouschet-Alicante*, *Petit Bouschet*, etc., and the *Folle Blanche* or *Burger*, or with both the last two named. If the result is lacking in characteristic flavors and bouquets, the merchants will blend it with certain proportions of old high-grade wines of true Médoc vines, such as *Cabernet-Sauvignon*, *Malbeck*, etc., or, if Burgundy types are wanted, with rich old wines from the *Pinots*, *Meunier*, or *Trousseau*. These latter high-classed blending wines will probably come from the coast counties, or above a certain altitude in the Sierras.

If the experiment of using the *Folle Blanche* as a wine grape should fail anywhere, it may be relied on for distillation. Hence I have indorsed its widespread propagation, together with the *Burger* and *Colombar*.

WEST'S WHITE PROLIFIC.—This grape came originally to this State, many years ago, in a collection from Hovey's, of Boston, to the nursery of Mr. George West, of Stockton. There were two vines in the lot, and and for years they attracted attention on account of their great vigor and constant fertility. For these reasons, Mr. George West propagated a considerable lot of this variety, and made up the fruit into wine for distillation, together with *Rieslings* and sometimes *Missions*. The quality of his brandy began to attract attention, and finally the improvement was traced to this grape, which was then named *West's White Prolific*, to avoid confusion. The true name is not now known. Brandy of 1881 from this grape has this year been

sold in San Francisco, and has elicited much admiration, being Cognac in type and much finer than any other known product of its age, and much finer than any of Mr. West's older distillations from mixed grapes. This result, together with its marked resemblance to the *Colombar*, though more fertile, causes me to believe that it belongs to the Cognac group by some relationship. Wine made from this grape has remarkable keeping qualities. I found it impossible to spoil it during the last year, though testing a demijohn, two thirds empty, during six months, in many ways—by the side of the kitchen stove, in a sunny window, etc. Whether this quality comes of the soil of Mr. West's vineyard, or is a constant property of the grape, remains to be proved. The wine has a peculiar flavor, but very agreeable. At Mr. West's it attains a high degree of alcohol. If fermented from grapes less mature, probably the brandy would be still further improved.

West's White Prolific is therefore to be classed with our groups of varieties for Cognac types of brandy. I believe, also, that along the Sierra foothills and in Southern California it may be used when fully ripened for a type of sherries.

FEHER SZAGOS.—This variety received its name at a State Fair in Sacramento, when being exhibited by Mr. Bugby. The words mean simply *white grapes*, and serve only to designate a lost child of viticulture. What its true name is we do not know. What its use will be is also obscure. The wine from the old vines of the Bugby vineyard near Folsom becomes very light as the vines grow older, and last year it was scarcely merchantable except for distillation. A sample that I kept in a half-filled bottle in my office was examined a few days ago, after a year's exposure, and was found to be perfectly free from acetic acid, though very light in alcohol, and affected by lactic acid. Mr. Haraszthy believes that this wine has value for blending purposes. In Napa County I have seen a wine from it of rather inferior quality. In the Eisen vineyard, near Fresno, it produces abundantly, and its wine, a sample of which is now four years old, has taken on a marked so called sherry character. This sample is certainly worthy of study, and other experiments will be made. I should not, however, risk planting this grape for sherry purposes except where there is intense Summer heat and a general disposition of other varieties towards a high saccharine percentage. It would no doubt produce a good brandy, but not so surely as the varieties I have named for such purpose.

ZINFANDEL.—This should be classed as a white wine grape of importance, but I reserve notice of it for its place under red wine grapes.

MISSION.—The *Mission* variety, so named after the Spanish Missions, where it is found, is probably a seedling propagated by the Franciscan fathers. There is no variety of Spain that we know to resemble it. The sherry grapes are well known and in no respect resemble the *Mission*. But if the *Mission* is to have any role in future in our viticulture, it will certainly be only as a blend for sherries of an inferior type, or as a table fruit. It will no doubt be used for some time for sweet red or port types, but must gradually be abandoned even for that as finer and more sanitary products are made from other

varieties. When our Los Angeles friends have practiced awhile with *Mataro* and *Trousseau* as a base with *Grenache* blends for ports, they will find their wines will give them less trouble in transportation, will have fine character, and will be so wholesome that, like the old fashioned Englishmen, our American lovers of sweetish wines or ports will drink their bottle without ruining their digestion. I have, therefore, classed the *Mission* as a white wine variety. As a dry red wine grape, it is a nuisance. As a brandy grape, it is a hindrance to our progress; because one has only to try *Mission* brandy a few times to be satisfied that whisky is the better drink. The same property—whatever it may be—that makes *Mission* wine so “heady,” appears to go over in distillation and imparts the same trouble to the distillate. I have never used *Mission* brandy without suffering afterwards from a dull headache with almost a suicidal tendency. I have never had such a result after using brandies from our other grapes—even the pomace brandy of Napa County is not so objectionable. Probably if the *Mission* grape were picked before complete maturity, the brandy might be free from its most objectionable features. I say these things as forcibly as I can, because I realize that any unwholesome product of viticulture will seriously retard our progress in our contest against the whisky and beer markets. Those who have *Mission* vines should use them as stocks to graft better varieties upon as soon as experience tells them what selections to make. In Los Angeles County they need not fear to use *Mataro*, *Carignan*, *Grenache*, and *Trousseau*, and two years by grafting will determine other varieties.

VERDELHO.—This is *par excellence* the finest of the Madeira varieties. It also enters into the Sherries of Spain and the finest liqueur wines. It is found in this State in very small lots; therefore it is not much known. However, its history is a sufficient guaranty for its use here, where we lean towards the Sherry, Madeira, and liqueur types in many places. It does not appear to be a very abundant bearer, but its quality should cause it to be grafted in where Sherry, Madeira, and liqueur wines are aimed at, to at least a limited percentage. In Fresno, if it does not sunburn, it will hasten progress towards desirable types; so, also, in Los Angeles County, and other similar districts. I believe its value should be tested also in Napa and Sonoma. A small percentage of noble grapes will work wonderful results in our vineyards; witness the effect of a small dose of *Riesling* in tanks of *Burger*, *White Malvasia*, *White Zinfandel*, etc.; or the effect of a little *Chauché Noir* or *Trousseau* on a bottomland *Zinfandel*.

FRONTIGNAN.—Of all the varieties with Muscat flavor, the *Frontignan* is by far the finest for wine making. It is called *Muscat Blanc* (White Muscat) in France, but to avoid confounding it with other very different grapes, let us keep the name *Frontignan*, the name of the place where it made its greatest reputation before the phylloxera devastated it. Where this variety will succeed best, I cannot tell. It does very well in Stockton, and I feel safe in predicting success with it in the climate of Southern California. In Fresno I do not know whether it will stand the intense Summer heats. In Stockton there can be produced from it a most superior liqueur, or sweet wine, with delicate Muscat flavor, which surpasses, I believe, the famous *Frontignan* wine itself. If enough were made to warrant some merchant

making an effort to bring it before the public in England, and in Russia, I believe that it would add lasting credit to our industry.

It may be used in very small proportions to flavor otherwise characterless white wines. I have known very important improvements in otherwise very ordinary brandy being made by mixing its wine with the other before distilling. This proves nothing new, for at one time *Frontignan* brandy was so famous that chemists even sold extracts to imitate it. *Frontignan* wine became too valuable to distil.

An excellent wine is sometimes made in the south of France by blending *Mataro* (fermented when over-ripe) with the *Frontignan*. This wine is said to resemble the wine of Constance. This could be done wherever the *Mataro* could be ripened sufficiently.

SEMILLON.—This Sauterne variety, recently imported by Mr. J. H. Drummond, the Natoma Company, and myself, has already proved its value at Mr. Drummond's through grafting. This, however, as well as the other Sauterne varieties, viz.: *Sauvignon* and *Muscadelle de Bordelais*, can only be had now by direct importations from France, the vines in this State being insufficient yet to supply the wants of those who have them. Santa Clara, Alameda, Contra Costa, San Joaquin, Solano, Los Angeles, San Diego, and other similar regions, should get ready to propagate these vines, if they desire high quality Sauternes. Napa and Sonoma may also be benefited by them. (N. B. Mr. H. W. Crabb has also made a superior wine from the *Semillon*. Since writing the preceding lines, propagation has produced probably sufficient for immediate demands of those who wish to graft.)

SHERRY VARIETIES.—The important true sherry varieties of Spain, such as the *Listan*, or *Palomino Blanco*, etc., are practically unknown to us, although during the last year some stocks have been imported for trial. This and the Sauterne groups have been strangely neglected. Our best success may be in those types. The *Pedro Ximenes* belongs to this group, and the few vines now cultivated are doing well.

BURGUNDY AND CHAMPAGNE VARIETIES.—Of the varieties which produce the noble white wines of the Burgundy and Champagne districts of France, we have very few propagated in California. The true Burgundy *Pinot*, of which there are several varieties, is so light a bearer that it has been generally discarded as a practical variety. Mr. Benson, of Napa County, has the *Plant vert dorée* and the *Valranne* of the Champagne country in sufficient numbers to commence testing its wine. A sample I have tasted was excellent. The white and gray *Pinot*, which make the famous Chablis wine, are not practically known to us, although we have scattering lots of *Klevner* (*Gray Pinot*) and *White Pinot*; I believe that a *Melon Blanc* in Santa Clara County, which Mr. Crabb is now using in grafting old vines, is a true white *Gamay*. I am going to test the *chaintre* system of pruning on these shy bearing vines, and perhaps I may succeed in getting a profitable crop. The *Pinot* ripens too early for the hot valleys. (N. B. During the present season (1884) Mr. Drummond has shown all the true Burgundy varieties bearing well, having pruned them systematically with very long canes. The *Pinot Mourad*, a gray variety, bears abundantly.)

CHAUCHÉ GRIS.—This variety came first to Santa Clara County together with the *Chauché Noir* from the country north of Bordeaux,

France—the *Lower Charente*. I find the two together in the collection imported from the Charente by Mr. P. Pellier, and I have little doubt that they both were propagated from his collection through the San José nurseries. In St. Helena we find a grape which I cannot distinguish from the *Chauché Gris*, viz.: the so called *Gray Riesling*, or *Gray d' Ischia*. I believe it is the same variety and that there never was any authority for the name known in St. Helena. There was a *Black d' Ischia* in Colonel Haraszthy's collection, which resembles the *Chauché Noir*—hence some one has named the *Chauché Gris* the *Gray d' Ischia* by reason of the resemblance. This *Chauché* is the gray variety of the *Pinot de Poitou*—known as *Black Pinot* in many parts. It is not a Burgundy vine—but comes from the west of France. With long pruning, in good, moist, deep soil, it yields abundantly. The wine is of fair quality, but varies with the soil apparently; where it may make a fine wine, if anywhere, we do not yet well know. It will probably succeed in many places too warm for the *Riesling*. It will furnish a good stock to graft on for those who may get tired of cultivating it. I use the word "fine" with discretion; few varieties will make *fine* wine, though many may make good, or fair quality.

ORLEANS.—This is a white grape, generally called the *Orleans Riesling*. I think there is no good reason for calling it a *Riesling*. It is cultivated in this State principally at the Orleans Hills Vineyard, now the property of Messrs. Arpad Haraszthy & Co. It was first imported by Mr. Jacob Knauth, of Sacramento. At the Orleans Hills it ripens early, but in such warm situations (near Capay Valley, Yolo County) it appears to need some companion to assist and complete fermentation. The proprietors are now adding *Folle Blanche* and *Burger*, I understand, for that purpose.

In the Napa and similar valleys, it should go to the warm hillsides; it does not ripen early there. It is a prolific bearer; and would probably make a good combination with *Folle Blanche* and *Burger* for the southern counties. Mr. Haraszthy considers this variety as of fine quality.

RED WINE VARIETIES—MISCELLANEOUS UNCLASSIFIED GRAPES.

ZINFANDEL.—This variety was imported and extensively propagated by Colonel Agoston Haraszthy and by others who followed his advice. He knew the grape in Hungary and recognized its value as a foundation for sound salutary table clarets. The same variety came, in small lots, at an early day, from eastern nurserymen, who called it *Zinfindal*; one American authority says it was called also *Zinfandel*, and that it came from Hungary. It was not extensively propagated from the early nursery stocks, but became sufficiently scattered throughout the State to cause much present confusion in the popular claims for recognition as to the credit that is due for introducing it. That it was directly imported by Colonel Haraszthy is known to his family, and that its extensive use was due to his efforts is well known to the State. It is probably known in Hungary also by some other and more popular name; the leaf and shape of the bunch resemble much the celebrated *Kadarka* of that country; the wine also is generally Hungarian in character. Possibly it belongs to the *Kadarka* family. Certainly it does not appear to belong to the varieties of *Sylvaners* or *Zierfahndl*, described by Count Odart.

I have seen four samples of old *Zinfandel* wine in this State which had such a remarkable resemblance to high classed *Médoc* (Bordeaux) wines that for all practical purposes I shall continue to recommend it for blends of Bordeaux claret types, although I think that judicious blends with Burgundy varieties can also be made. The four instances of true *Médoc* types from the *Zinfandel* were, viz.: samples of wine two to four years old from the vineyards of J. H. Drummond, Glen Ellen, Sonoma County, and of the Natoma Vineyard Company, Folsom, Sacramento County; also, from the wineries of Messrs Anduran & Co., Napa, and Messrs Brun & Chaix, Oakville, Napa County. Where the grapes in the two latter cases grew I do not know. In three of these instances I believe there was no doubt as to the absolute purity of this wine—being from *Zinfandel* grapes only. In these instances I recognize the finest matured wines of Bordeaux type that I have ever seen in the State. In each case the peculiar *Médoc* characteristics were produced by age and were not detected in the new wines. I am therefore convinced that in districts where the claret types are possible and where the soil is proper, the *Zinfandel* is destined to assist us in rivaling the most popular of the French wines of exportation. It matures and develops its vinous qualities early and is probably at its best in three years from fermentation; after that it is subject to rapid deterioration.

The *Zinfandel* apparently flourishes everywhere that the grape grows in this State, but in the wine cellar it records many dismal failures. My present impression is that whenever its must marks less than eleven or more than twelve and one half per cent of alcohol for the wine, its product will be inferior and lose its *Médoc* character. In certain counties, such as Napa and Sonoma, it must have warm exposures, in others, such as Santa Cruz, I believe it will fail to properly mature; in others, such as Fresno and the foothills of the Sierras, it ripens too fast and often loses its character. In sandy and gravelly soils, where the proportion of clay is small, its wine is thin, lacking in color and greenish acid.

In soils where there is a firm foundation of clay it gives good color, and when such soils are well provided with red oxide of iron, and are well drained hillsides, it yields *finesse*, Bordeaux character and bouquet. Where there is an abundance of clay and no excess of moisture, the wine is not afflicted by free acid, but is delicate and velvety to the palate.

In many places, such as Yolo and San Joaquin Counties, it should be classed, I think, as a white wine grape. Its must, when not fermented on the skins, produces wine, delicate in flavor and subacid, in those places where the crop is large and the saccharine in high degree. In the sandy granitic alluvial soil of Los Angeles County it should be made into white wine, unless experiment by fermenting it with the *Mataro*, or some similar variety, should prove a great improvement, or unless further experiments in fermentation produce more uniformly good results. In San Diego County we have found it succeeding well in the Cajon Valley, in red loam overlying a clay subsoil. Across the ridge, on similar loam, without clay, it fails to give color.

Judging from its acid and other general characteristics, I believe that it will produce fine brandy, where it does not overripen.

There will be many who will insist upon keeping *Zinfandel* unblended. Certainly where a perfect degree of maturity, neither under

nor overripe, can be obtained, together with good color, the *Zinfandel* promises well without the aid of any other variety. But I firmly believe that our markets will be better pleased with more solid and expressive wines. The *Zinfandel* and *Mataro*, each good bearers, will, I believe, become the favorite basis of our red wine vineyards, to be directed in expression towards favorite types by judicious blends with fine Burgundy or Bordeaux varieties. These blends, if perfected by being racked together as soon as each has finished the first violent fermentation, will be, I think, the foundation of our trade in dry red wines. The *Mataro* and *Zinfandel*, in many cases, may be fermented together with great advantage—the *Mataro* correcting any excess of ripeness of the *Zinfandel*. The addition of some suitable white variety of fine quality, ripening with the *Mataro*, will, if fermented together with these named varieties, add much to the quality.

The *Zinfandel* should not be long pruned; long wood results in light color and irregular maturity with this grape. Possibly this rule might be changed if the *chaintre* system of pruning be followed. I believe it is worth while to experiment in doing so.

MATARO.—Although this is not as extensively cultivated now as other varieties for red wine, yet its present popularity demands for it a place next to the *Zinfandel*. It comes to us from two parts of France, under different names. Along the Mediterranean coast it is called generally *Mourvèdre*, although it is sometimes dubbed *Etranglechien* (dog strangler), probably on account of the roughness of the wine when young. Along the Spanish coast it is known as *Mataro*, *Béni-Carlo*, etc. In the Charente, north of Bordeaux, it is called *Balzac*. We find it imported here under both names, *Mataro* and *Balzac*. It has been, without reason, called the *Upright Burgundy* at St. Helena, and *Miller's Burgundy* at Santa Clara; the former is an invention, the latter a misappropriation of name.

All the great French authorities agree in placing the *Mataro* as the finest red wine grape of the southern regions, and many, Count Odart included, have counseled its use, even in the Bordeaux districts. By reason of its peculiar adaptability, it can be cultivated much further north than its common southern associates, the *Grenache* and *Carignan*. It ripens generally a little later than *Zinfandel*, and its must should promise an alcoholic strength of twelve per cent before the grapes are picked; when picked at a less degree of maturity, it fails in color.

The apparent defect of this grape is the roughness of the new wine; but this is the defect of most noble varieties. Like the *Cabernet-Sauvignon* of Bordeaux, it requires age to develop its quality. It should be remembered here that wine which is agreeable when new, seldom improves with age; hence such goods go to early markets, unless blended carefully with wines that are durable. The *Carignan* has been generally preferred at St. Helena to the *Mataro*, because its young wine is more agreeable to the palate. I believe that the durable merit of the wine of Mr. Scheffler, known as *Carignan*, was due to the *Mataro* contained in it. The latter, it is true, should be considered as a blending variety, seldom to go alone to market. The *Carignan* supplies an acid and delicacy which improves it materially.

In testing red wine samples at St. Helena two years ago, the St. Helena Club gave the preference to a blend of *Mataro* and *Zinfandel*.

The chief merits of *Mataro* are, viz.: The vine bears well and resists early Fall rains; the fruit contains an abundance of tannin; the wine

is wholesome, easily fermented, and contributes its fermenting and keeping qualities to others with which it is combined. A mixture of *Mataro* in the fermenting vat with varieties that ferment with difficulty, is often a sovereign remedy in the south of France. Whenever it is well suited in soil, exposure, and climate, it gives an intensely colored wine. It dominates in the vineyards from which the Rousillon wines of commerce come. When excessively ripe, it combines well in port wines, and, if left to become overripe on the vine, and partially desiccated after picking, it has been combined with the *Muscat of Frontignan*, to make a superior liqueur wine—said to resemble the wine of Constance.

Dr. Jules Guyot, the most celebrated of French viticultural writers, says of this grape: "But, of all its advantages, that which should cause it to be carefully preserved in Var, in Provence, and in all those regions of the Mediterranean coast of France, where it is cultivated, is this—the wines produced by it are unaffected by disease, firm, agreeable, and salutary to a higher degree than the wines of any other varieties of those districts."

Mr. Pellicot, a later authority, and one most competent, says: "I believe we should add to the judgment of Dr. Guyot, that no other wine of our country (the south of France) stands transportation by land and by sea, and equatorial heat, better than that of the *Mataro*. The tannin, with which it is well provided, gives it, in a high degree, preservative qualities; but it is at the same time the cause of the astringency which is noticeable in the new wine."

I believe there are few red wine vineyards in California, whether for dry or sweet wine, wherein the introduction of a proportion of *Mataro*, varying from ten to seventy-five per cent, will not be a positive gain. The *Mataro*, however, should not be planted on shallow, poor, or dry soils; it flourishes best where there is a sufficiency of humus, or leaf mold, and where the subsoil permits the easy descent of its roots. It should not be placed in those vineyards where the *Zinfandel* and *Burger* do not ripen well. It yields well, when properly placed, with short pruning. In districts, possibly Fresno, where the *Mataro* may be sunstruck, I would advise grafting it on stocks whose roots suit the climate, such as *Missions*, *Trousseau*, *Grenache*, or upon the *Vitis Californica*, or *Arizonica*.

CHARBONO.—This variety, sometimes spelled *Charbonneau*, comes from the Jura, together with the *Trousseau* and *Poulsart*. (The Jura lies southeast of the Burgundy district, rising toward the Alps.) Its names are so numerous and so obscurely given, that this fact alone, together with the history written concerning it, indicates that it is not the most esteemed variety of that country. Its leading name is *Corbeau*; it was imported by Mr. Drummond, under another synonym—the *Plant de Montmélian*. It is undoubtedly true to name.

The reader should remember that different varieties of vines received local names throughout Europe long before there was any careful classification of them. The confusion of these names is bad enough; what we should avoid here is the misapplication of well known names.

The *Charbono*, in Santa Clara County, yields abundantly, and its wine, when under favorable conditions of culture, has a fine deep color. It will not, however, advance the cause of viticulture beyond the supply of a cheap marketable product for ordinary use. Its

characteristics are such that it generally covers up the finer qualities of better wines. Unlike the *Zinfandel*, it dominates its blends, whereas the *Zinfandel* lends itself to fine blends, losing its identity. Therefore I do not think that the *Charbono* will ever be as popular as *Zinfandel*—its uses being more restricted. Its color, which, however, is not durable, will cause it to be always appreciated for light common blends of clarets, and its fertility will commend it to those who prefer quantity to quality. I believe that it will flourish best on warm deep soils, and that it will fail on cold clay subsoils. I have seen it failing on such cold soils, where the *Trousseau*, *Chauché Noir*, and *Zinfandel* grew well. The vines, in this instance, however, are young and not yet fruited. In the low rich lands near Santa Clara this vine has shown a tendency to be greenish and acid in vintage time. I think this was due mainly to forcing too large a crop, to too long pruning, and to staking high, because I have seen other samples in similar places giving well matured grapes. In the vicinity of Stevenson Creek, west of Mountain View, in Santa Clara County, especially in the vineyard of John T. Doyle, Esq., it reaches apparently its highest perfection. The *Charbono*, no doubt, has come to stay, and will be prized for its fertility; the wine, if blended with *Mataro*, *Trousseau*, and *Chauché Noir*, will be plentiful, and salable as an ordinary claret, lacking finesse, but possessing good wholesome properties. Those who desire to produce only high grade wines should not plant this variety.

General Naglee has won for this grape probably its highest praise through his so called Burgundy brandy, which, at the age of ten years, develops a faint delicate aroma and bouquet. I suspect, however, that this aroma and bouquet are due to the certain percentage of *Trousseaus*, which he has among his *Charbonos*. His young Burgundy brandy does not show any noticeable quality other than purity of spirit and freedom from the disagreeable headiness which is common with Mission brandy. Other grapes appear better suited to making fine brandy, with abundant ethers and desirable flavors.

The role of the *Charbono* is certainly confined to the making of light cheap table clarets, in the coast counties particularly. It suffers from early Fall frosts in low places.

TROUSSEAU.—This variety came to San José together with the *Charbono*—both being imported, I believe, by Mr. Delmas, many years ago. These, together with a number of others, were started out as “Burgundy” stocks, thereby causing the confusion that now prevails. It is proper to say here that the term Burgundy, as applied to wine, is probably now purely conventional, and has lost among our people its original meaning. Commercially speaking, it is now common to call any dry red wine having more than twelve per cent of alcohol, and being rich in body and flavor, a Burgundy. In France, also, the original distinction is becoming lost to the general consumer, and wines from the Jura and Beaujolais are sent out as Burgundies; hence we are drifting into calling all the varieties cultivated from Lyons to Dijon Burgundy grapes, including *Charbono*, *Trousseau*, *Poulsart*, and *Gamay*, as well as the *Pinots*. These grapes vary so much in quality and general characteristics of production, that I deem it necessary here to make these remarks, because many ambitious young planters, aiming to reproduce the wines of Chambertin,

etc.—true Burgundy, as they have known it in their travels—are being misled by our false nomenclature.

I have, however, often written to correspondents, using popular language where necessary, and counseled them about combinations of varieties for Burgundy types, as commercially known. In this sense I have often urged the planting of the *Trousseau*, together with other fine varieties. And in this sense I shall generally use the expression Burgundy type—the true Burgundy being a wine that probably will never become popular in California, for reasons to be given hereafter.

The *Trousseau*, like the *Mataro* and *Zinfandel*, is destined to become widely cultivated in this State, on account of its general adaptability and its fine qualities. Although to be classed as a leading one among so called Burgundies, it possesses keeping qualities quite contrary to those of the *Pinot* family. It is especially valued in the Jura for its preservative qualities, when blended with other wines, such as the delicate *Poulsart*. It has abundant tannin, good flavor, and imparts a rich Burgundy character to a blend of *Zinfandel* and other varieties. If combined with *Crabb's Black Burgundy*, *Meunier*, and *Chauché Noir*, the result in favorable locations would be a rich Burgundy type, suitable for the English market, especially if some *Mataro* should be allowed to grow old together with it.

The *Trousseau*, like the *Chauché Noir* and *Gris*, and *Riesling*, ripens its wood early, and is not affected by early Fall frosts, even in very exposed places. It bears well with long pruning, and is a very vigorous vine.

French authorities nearly all concur in declaring that the *Trousseau* is identical with the *Bastardo*—one of the two vines most celebrated in the Douro, Portugal, for making the highest classed port wines. I have imported the true *Bastardo* with other Douro varieties, and am able to attest the resemblance. More especially have its port wine characteristics been proved by Mr. George West, of Stockton, Mr. L. J. Rose, of San Gabriel, and Captain Merithew, of Stevenson Creek, Santa Clara County. It is probably the same as the *Bastardo*, and it is certainly a superior variety for port wine, in such districts as Solano, San Joaquin, the Sierra foothills, Fresno, and Southern California. For dry wine it will excel in the bay counties, and, if picked at the proper time, in the vicinity of Stockton.

I have personally tested port wine made from this grape as compared with that made from the *Mission* variety. I found that I could drink half a bottle of the *Trousseau* with impunity, enjoy it, and feel no disagreeable after consequences, while the same quantity of *Mission* I should not dare to consume. It is possible that when we make our ports out of *Trousseau*, with suitable blends, such as the other known Douro varieties, or with our *Mataro* and *Grenache*, port wine drinking may become popular in the United States.

CHAUCHÉ NOIR.—This is the brother of the *Chauché Gris*. It is found quite frequently in the Santa Clara and Santa Cruz vineyards, and sometimes scattered among the *Chauché Gris* near St. Helena. Whether it is the same variety as Schram's *Pinot* (formerly called by him *Merlau*), Mr. Chas. Wheeler's *Black Pinot*, and the *Black Cluster*, *Black d' Ischia*, and *Black Riesling*, of other places near St. Helena, I shall discuss later. The wood, foliage, and general aspect of the *Trousseau*, *Chauché Noir*, *Chauché Gris*, and *d' Ischia Noir* have a

striking resemblance. The *d' Ischia Noir* was imported by Colonel Haraszthy, and no doubt propagated in the early St. Helena plantings. When the *Chauché Gris* appeared from Santa Clara, its resemblance to the *d' Ischia Noir* no doubt was the cause of its acquiring the name "Gray d' Ischia." So we may be apt to confound the *Chauché Noir* with the *d' Ischia Noir*. My impression now is that the *Chauché Noir* is only found in a few scattering places at St. Helena among the old vines, such as at Captain Niebaum's (in the old vineyard), at Mr. Scheffler's, and at Mrs. Weinberger's. No mistake need be made, however, in propagating this vine from Santa Clara and Santa Cruz Counties.

It is improperly classed as a *Pinot*, although where it grows, in France, it is also called *Pinot de Poitou*. It bears very little resemblance to the true Burgundy *Pinot*. It is a light bearer, generally; yet, with proper long pruning, the crop is sufficiently satisfactory to the vintner. It is a variety that may well be associated with either the Burgundy or the Bordeaux types, producing, as it does, a wine intermediate in character. It grows in France in the regions north of Bordeaux, and is very hardy.

In Santa Cruz County, when well ripened, it makes excellent wine of fine type. In St. Helena, it may be seen at Mr. Scheffler's, where, in combination with the *Meunier*, it was used to make his "Burgundy" wine, so much admired two years ago. It will be remembered that it was first given out that the grape which produced that "Burgundy" was the *Franc Pinot*. I was shown what was said to be the vine, and declared it to be the *Chauché Noir*. The vine I saw was the *Chauché Noir*; but since then I was shown another block of vines, which also contributed their quota to this wine. These were *Meuniers*. There were no *Franc Pinots* among them, that I could discover. So we are left in doubt as to how much of quality in that "Burgundy" wine was due to the *Chauché*, and how much to the *Meunier*. I think, however, that the *Meunier* contributed in most part the color and the body.

Mr. Morel remarked, when showing this wine in Mr. Scheffler's cellar, that it did not resemble a true Burgundy, but was a fine reproduction of Roussillon. Count Odart, in his *Ampélographie*, says of the *Chauché Noir* that its wine, when made under favorable circumstances, recalls to mind the wines of Roussillon. Mr. Morel and Count Odart agree in describing the wine; but the former was undoubtedly mistaken in calling the vine a *Franc Pinot*. The cause of the confusion was in the loss of the true names in a vineyard planted before Mr. Scheffler came into its possession.

I have deemed these remarks worthy of place here, because our St. Helena vine-growers would like to know how to reproduce the wine made at Mr. Scheffler's. Let them cultivate *Chauché Noir* and *Meunier*. Time may prove that there was also some *Malbeck* in that wine. I think so. It is difficult to obtain the exact truth in such matters.

MEUNIER.—I introduce this variety here, because of its connection with the preceding. It is very little propagated at present—only a few thousand vines now in bearing. Its excellence, however, is a matter of history, and is corroborated by the experiment in Mr. Scheffler's vineyard, already referred to. It is found in small lots in Santa Clara and Santa Cruz Counties. It is called also *Miller's*

Burgundy; but this name has been improperly applied, in some places in Santa Clara County, to the *Mataro*. It is a creeping vine—canes running naturally close to the ground. Both sides of the leaves and the canes are whitened with down; hence its name, *Meunier* (Miller). It is cultivated also in the Burgundy districts of France with the true *Pinot*; hence its name, *Miller's Burgundy*. It bears very much better than the *Franc Pinot*; but its quality is so good that it was admitted to a place in that noble company. No doubt it destroys somewhat the finesse of the *Franc Pinot*; but the sacrifice is not considerable. With long pruning, properly conducted, it will bear very well. It is eminently adapted to the *chaintre* system. Let some of our St. Helena planters try it on their sheltered slopes. If by planting new ground, plant seven by fourteen feet; if grafting, graft every other row; and as soon as the grafts are two years old, take out the alternate ungrafted vines, and lay the *Meunier* down in *chaintre* style.

This variety, like the Burgundy *Pinots*, should be well ripened—giving a wine twelve to thirteen per cent strong in alcohol; otherwise they do not show their fine qualities. The *Chauché Noir* will show quality with eleven per cent—in this respect being allied to the Bordeaux vines. I am inclined to believe that the *Meunier* will not generally succeed in the Santa Cruz Mountains, where the tendency is to light clarets rather than to Burgundies.

There is an apparent inconsistency in this statement, because the *Meunier* is an early variety—earlier than *Chauché Noir*; but nature is inconsistent. Although an early ripener, it does not develop its full quality in a Santa Cruz climate. If it were taken to the San Joaquin Valley it would ripen too fast, and be fit only for sweet wine. A variety to be properly ripened must not be subjected to a climate or situation that causes it to pass its limit of perfection. On warm rich slopes of Santa Clara, Alameda, Contra Costa, Napa, and Sonoma Counties, the *Meunier* cultivated in *chaintres* would succeed admirably.

In carefully constructed and managed cellars its wine would be brought through safely; but in cold, badly regulated cellars, it would be found difficult to clear, its fermentation partaking of the difficulties of the Burgundy wines. For making a choice wine to supply a cool San Francisco market it would, no doubt, be profitable for experienced wine makers to handle; but in general there should be plenty of *Chauché Noir*, *Trousseau*, and some *Mataro* to blend it with. It would impart to them its *finesse* and bouquet, and would be preserved by them by finishing its after fermentation in company. The tannin of these grapes would precipitate the albumen of the *Meunier*, and perfect a wine of fine quality and of commercial Burgundy type. It could be combined with the hillside *Zinfandels* and *Mataro* at St. Helena with advantage. A little judicious grafting would add much to the St. Helena wines in a very short time.

CRABE'S BLACK BURGUNDY.—This variety has been given a conventional name for purposes of identification. Mr. Crabb obtained it from Mr. Delmas, who brought it to Green Valley from San José. I find it in Mr. Pellier's collection under the name of *Petit Pinot*. He claims that he imported it, together with his other varieties, from the Charente, France. I find all his collection, except this one, true to the descriptions given by Count Odart of Charente varieties.

There is a *Petit Pinot* in the Charente, but it is a white variety. I believe there is no doubt but that it came from the Charente, and it may be the vine described by Odart as the *Pinot Noir* of that district. It is a vine of great prospective value for our coast counties. It produces well, even with short pruning, gives a wine of fine color and Burgundy type. It ripens nearly as late as the *Zinfandel*, and might be fermented together with the *Malbeck*; possibly in some seasons with the *Zinfandel*. It has a drooping growth, and would probably do well on sloping lands in *chaintres*. Combined with *Mataro*, *Zinfandel*, and *Trousseau*, it would probably finish its after fermentation in safety. Or with *Trousseau*, *Chauché Noir*, and *Meunier*, carefully handled, it ought to make a fine Burgundy type.

THE BURGUNDY PINOT.—This, *par excellence* the Burgundy vine, boasts of a family of varieties, of which the *Franc Pinot* is the chief. It is not yet cultivated in any quantity sufficient to give token of its merits in this State. It has been abandoned on account of its very shy bearing. However, those who have tried it in the past have generally subjected it to short pruning, and there is yet not any true test of its value to us. By the *chaintre* system I believe it could be made to yield fairly on our good Napa and Sonoma hillsides and in similar good places, a crop of two tons and a half to the acre. This would be profitable if the wine should prove of fine quality. It will require considerable experiment before we make any positive advance in this direction. Mr. J. H. Drummond has inaugurated experiments at Glen Ellen, as I have done also near Livermore. The *Pinot de Pernand* appears to be the most fruitful.

PETITE SIRRAH.—This noble variety is the same that forms the foundation for the grand wines of the Hermitage and Côte Rotie in the Valley of the Rhone, France. It requires long pruning and is a shy bearer, though a vigorous vine. Its vigor indicates to me that by the *chaintre* system a profitable crop might be obtained; at least I am willing to test it. A small quantity of wine made in 1882 by Mr. Drummond sufficiently proved its fidelity to its reputation. None are yet planted in practical quantities. A white grape, the *Roussanne*, is the most prominent associate that it has in the Hermitage. So much is thought of the Hermitage wines in France that a large portion is taken to Bordeaux, there to be blended with the fine Médocs. I believe that the *Sirrah* would succeed well at San Gabriel, although a small crop could only be expected; it would set its berries well also in San Diego County, probably. It is fruiting well at my vineyard near Livermore this year (1884).

The *Sirrah* makes a wine celebrated for its keeping qualities.

I find that the *Vignoble* asserts that in proper soils with full long pruning this vine bears very abundantly. (N. B. While correcting the proof sheets of this topic, I have had an opportunity to examine Mr. Drummond's experiments this year in training this variety with very long canes on trellises. The result has proved successful—fine crops being obtained.)

MALBECK.—This vine, of which there appears to be several varieties—generally classed under the name *Cot*, viz.: *Cot à queue vert*, *Cot à queue rouge*, *Cot de Bordeaux* (this last is properly the Malbeck), is the most popular claret grape through the center of France—from

the Burgundy district to the Atlantic coast at Bordeaux. Of the ordinary Bordeaux, as known to the world, the wine from the *Malbeck* is no doubt the characteristic base. Near Bordeaux it is cultivated in the bottom lands, or *palus*, besides being in certain proportions in choice Médoc vineyards, though not in all. A Bordeaux critic says that the *Malbeck* is the most inferior variety that can be suffered to enter into the composition of the celebrated Bordeaux clarets. This, however, is drawing a fine point, because *Malbeck* wine is relatively superior to the greater portion of the French vintage. If we only had our California clarets up to the standard of a good *Malbeck*, we should have no fear in entering the markets of the world; we could sell now a hundred million gallons of *Malbeck* wine to France, especially if partly composed of *Tannat* and *Zinfandel*.

Of the Bordeaux varieties this is the only one that has been sufficiently propagated here to be considered practically introduced. The other higher classed varieties were gradually abandoned because their crops were so light and proper systems of pruning were not understood, and even the *Malbeck* was only preserved in a sufficient quantity in Mr. Lefranc's vineyard in Santa Clara County, although it is found scattering throughout several others. A few have tried to propagate it systematically in recent years—notably Mr. G. Groezinger of Yountville, Captain Niebaum of Rutherford, Mr. Scheffler of St. Helena, Mr. J. P. Smith and others of the Arroyo del Valle district in the Livermore Valley, and the Natoma Land and Water Company. Mr. Crabb of Oakville is also to be mentioned in this connection, and to his experiments mainly is due the present favor with which the vine is received. Mr. Lefranc has not pruned his *Malbecks* as they should be, and has practiced generally picking his grapes overripe. I have seen two only of his vintages of this grape which were successful in point of perfect fermentation. Those, however, have caused me to believe that in this State we need not despair of rivaling the highest types of Bordeaux wines. The bouquet and general character were exceedingly fine. Mr. Crabb has shown that with this vine he can get abundant color in places where *Zinfandel* and *Mataro* refuse to respond. It is indeed a grape for alluvial soils.

It is subject to *coulure* (failure to set its fruit), and in 1883 was one of the many choice varieties that succumbed to the hot blasts in June. This ought, however, not to discourage planters too much. We cannot produce choicest wines and obtain highest prices without some sacrifices. If it can be cultivated profitably in France, it ought to be done also here. The *Cot* is the variety most used in the region where the *chaintre* system was invented. There it yields more than twice as much by the new system as it did under old systems, most carefully managed. I believe that by the *chaintre* system we may succeed in our coast counties in profitably cultivating the *Malbeck*. I should not expect it to succeed well in regions of great heat and sudden extremes of temperature. With *Malbeck*, a combination of *Mataro*, *Zinfandel*, and *Chauché Noir* ought to produce a fine wine of Bordeaux type after two or three years in cask.

Mr. Lefranc calls his variety *Cabernet-Malbeck*; that is because he believes he has *Cabernets* mixed with it. If there is such a mixture, which I do not doubt, it is one of advantage. True collections are now being propagated most extensively, being those of Mr. Drummond, the Natoma Land and Water Company, H. W. Crabb, Hon. M. M. Estee, and my own—these will serve to verify the vines now

planted in mixture. I believe it would be wrong to tie this variety up to high stakes, as is done at St. Helena with *Riesling*. Such a practice cannot be followed with black grapes without loss of quality and color. Some one of the methods practiced near Bordeaux, or the *chaintre*, must be adopted for the *Malbeck*. The fruit must be kept near the ground to secure even maturity and good color.

Those who have been disappointed with the *Malbeck* this year should remember that this is an unusual year for such varieties, the *Malbeck* not being the only one to suffer. Moreover, those who would profit by quality can afford to take some risks. I would counsel the use of the *Malbeck* with the *Mataro* in *Zinfandel* vineyards—the *Malbeck* being in a proportion of about twenty per cent. Future experience may demand for it a wider range.

CABERNET-SAUVIGNON.—This is the highest type of Bordeaux claret grapes. It is a very shy bearer and demands long pruning—trained low. It is only experimentally known here at present. The sample of wine made by Mr. Drummond in 1882 was more admired at the last State Viticultural Convention than any other on exhibition—notwithstanding its youth. Those who are now experimenting with this variety are importing their cuttings from France. Mr. Crabb has this variety from several sources; his first sample of wine was excellent. Mr. Portal, of San José, is pruning it successfully according to the Médoc system. I am testing its practical value near Livermore. Hon. M. M. Estee has made an importation; so also has Hon. J. T. Doyle. I believe that those who aim at fine wines of Bordeaux type cannot afford to be without it. Those who intend to use such vines would probably be wise to plant resistant stocks while experimenting with them; as soon as they have determined what they will select to graft with, they will have well developed resistant roots ready for their work. That is the plan I am pursuing. I have an experimental block, where nearly all the most celebrated vines are growing; meanwhile my fields of *Californica*, *Riparia*, and *Arizonica* are losing no time in burying their roots deep into my rich marl subsoil. I have already grafted many varieties to test them—hoping to succeed well with either the *Cabernet-Sauvignon*, *Petite Sirrah*, or *Franc Pinot*, as a principal stock, my resistant roots nearly all being planted for the *chaintre* system—some 7x14 feet, some 7x21 feet.

I shall not mention the *Verdot*, *Merlot*, and other Médoc vines. This paper cannot be extended so far as to discuss all important experiments; I aim to cover leading features only.

CARIGNAN.—I do not participate in the opinion of those who are now inclined to give this variety a higher rank than it has in Europe. I believe they are misled by the delusions of new wines. It may be safely said that when new wines are agreeable to drink they will not be improved by age.

It shows more acid than *Mataro*, or *Grenache*; hence one good reason for their association.

The *Carignan* is a variety from the Mediterranean coast of France, and is there cultivated with the *Mataro* and *Grenache*. I cannot find that it dominates in any vineyard. It is a most valuable vine, used in conjunction with such grapes as the *Mataro* and *Grenache*. It is best suited to districts where the earlier ripening noble vines are apt

to become overripe. It requires short pruning. It is one of the most subject to *oidium* and mildew, and needs careful sulphuring.

GRENACHE.—This vine is so vigorous and fertile, and so well adapted to dry warm regions, that there is danger that it may be planted too numerously. Its chief value is in adding finesse and delicacy to the *Mataro*, although it may be used to make a sweet red wine. It is destined to play an important part here. For the interior and some parts of the south, together with *Mataro* and *Carignan*, it will probably find its true place, as in Europe. It will succeed and flourish in arid places, where a *Zinfandel* would fail, and it will strike its roots into rebellious soil where a *Mataro* would perish. It should be kept away from early Fall and late Spring frosts.

POULSART, OR PLOUSSARD.—This variety, which is known as the vine of finest quality in the Jura, where it is cultivated with the *Trousseau*, *Béclan*, etc., is found, true to name, in Mr. Pellier's collection, though in small numbers. It is very subject to *coulure*, and was not propagated for that reason. Mr. Portal has a vine which he calls *Ploussard*—one of the synonyms of *Poulsart*—which, until the last State Viticultural Convention, was supposed to be correctly named, notwithstanding its fertility. When shown at the convention, however, it was clearly not correctly named. It is no doubt a valuable grape, but what its true name is, we have not yet discovered. Mr. Portal's vine might be profitably propagated, but the *Poulsart* is not a desirable acquisition until after experiment has proved that it may be suited to the soil and climate selected for it. It is bearing well this year at Mr. Crabb's; but this is exceptional.

FOLLE NOIRE.—This is also a fertile vine of the Charente, apparently giving good color and quality to claret blends. Not much, however, is known of it here. It bears well in the one place that I have seen it.

MISCELLANEOUS VARIETIES.—Experiments are now being made with a great many other important vines, such as *Tannat*, *Mondeuse*, *Aramon*, *Clairette*, *Colombaud*, the Portuguese varieties, etc., but the record is too voluminous for the present writing. I have touched upon the most important varieties for those who wish to plant new vineyards with stocks that can now be obtained in the State; also, the well known types which we should strive to reproduce if possible and practicable. The studies of Portuguese, Sherry, and Madeira varieties are too new for much comment.

COLORING VARIETIES.—There are varieties of vines specially valuable for their coloring properties—useful to the wine maker whose wine is deficient in color. Prominent among these is the American grape, *Lenoir*, which has a colored juice, and whose wine is a tincture of coloring matter. It has the merit also of being a vine resistant to the phylloxera; but it is very difficult to propagate. Those who wish this variety had better graft it low down on vines already growing, so that it may strike its own root above the point of union, and so accomplish also its resistant role.

Mr. Crabb has two vines, which he calls *Pied de Perdrix* and the *Gamay Teinturier*, both of which give intense and beautiful color.

The former, I believe, has been accidentally misnamed. The common *Teinturier* is well known, but its crop is too small to permit it to be much used.

In the south of France, during this generation, there has been created a new family of coloring varieties—being hybrids between fertile heavy-bearing vines and the *Teinturier*. This is the Bouschet collection, most of which I am now experimenting with. The best known are the *Petit Bouschet* (hybrid between *Aramon* and *Teinturier*) and the *Alicante Bouschet* (hybrid between *Petit Bouschet* and the *Grenache*). The latter grows vigorously with me, and I shall see its fruit this season; so, also, I shall have fruit from the *Petit Bouschet*, *Gros Bouschet*, *Petit Bouschet et Morastel*, etc.

We shall soon know how to correct deficiencies of color. In Fresno, at the Eisen vineyard, I have observed that the *Teinturier* and the *Norton's Virginia* fail to give their accustomed color. I noticed the same as to the *Teinturier* at Folsom. I have been informed since, that the Fresno vine was mixed with other grapes. These varieties would, no doubt, give better color if fermented with rich sweet musts of other varieties.

The *Cynthiana*, of the same family as the *Lenoir*, should receive attention as a variety valuable for color, and finer in quality, but less fertile.

AMERICAN RESISTANT STOCKS.

I shall refer only briefly to American stocks for grafting—not those valuable for their fruit. This subject has been fully treated upon in my first annual report to the Commission, excepting perhaps the latest knowledge concerning the *Californica* and *Arizonica*. I shall now only dwell on this topic sufficiently to speak of three species which I consider most important. The *Vitis Rupestris* is worth much attention, but has not yet been grafted upon sufficiently to warrant unqualified opinions. It grows well on dry hillsides. I am propagating the Champin hybrid of *Rupestris* and *Mustang*, which roots easily, from cuttings, and grows vigorously.

VITIS RIPARIA.—This wild species grows in the Mississippi and Missouri valleys, having the widest range of adaptability known to any vine. It is now the favorite grafting stock in Europe; it grows easily from cuttings, and is reliable as a resistant vine. Seeds can be procured by those who wish to propagate seedlings.

VITIS CALIFORNICA.—This is the native wild vine of California. I was the first to send it and the *V. Arizonica* to Europe for experiment, and have cultivated and propagated it largely for four years. It is certainly a resistant vine; our experiments in Sonoma clearly demonstrate this fact. It is also a vigorous grower, when in cultivated ground, and makes a stouter trunk to graft into than any other of the wild species now used. It strikes deep tap roots and takes the graft of all the European varieties that have been tried, with great facility. In my opinion, all its merits being considered, it is superior as a grafting stock to all others. It does not take root readily from cuttings—so the plant must be, for practical purposes, propagated from the seed, which is not difficult to accomplish. About 350,000 seedling *Californicas* have been planted in this State during

the last three years. Where there are Summer rains, or sea fogs, it is very subject to mildew; but such conditions which trouble this species in France are not appreciable in California.

VITIS ARIZONICA.—This is the wild vine of Arizona. My first essays were with seed procured at an altitude of six thousand feet above the sea. It is unlike in growth any other species of American vine. It makes a straight thrifty stalk from the seed, and is more robust in the trunk than the *Riparia*. It is a most resistant vine. In San Diego County I have seen a specimen seedling, which I sent to Major Merriam, outstripping all others in the experimental block. With me in the Livermore Valley it prospers, but does not quite equal the *Californica* in growth. It can be propagated from cuttings with fair success. For two years I have failed to obtain fresh seed, the crop of wild fruit having dropped before maturity. I believe it will grow well on our most arid hillsides. There is no doubt of the very greatest resistance to phylloxera with this species. It appears to be absolutely proof, more so than any other that we have used.

RAISIN GRAPES.

Our French friends would have difficulty in translating the heading of this topic, as they say *raisin* when they mean grape, and we say raisin when we mean a certain quality of dried grapes. The varieties used for making raisins are very few in practice, although all varieties may be dried and might serve some useful purpose when so preserved. For practical use only the *Moscatel* family, the *Sultanas* (*Sultanieh*), and the *Corinths* are used for curing by drying, when intended for the raisin market. Popularly the products of these varieties are known as raisins, sultanas, and currants. Markets become commercially technical.

Commercial raisins are made from the Spanish *Moscatel Gordo Blanco*; inferior stocks were formerly made from the *Uva Larga*, as we do sometimes from the *Fehér Szagos*, etc.

Sultanas are made from the so called Seedless *Sultanas*.

Currants are made from several varieties of seedless grapes, generally known as *Corinths*; the word currant is simply a corruption of the word Corinth.

MOSCATEL GORDO BLANCO.—The *Vignoble* places under one category, as of one family, the *Muscat of Alexandria*, the *Moscatel Gordo Blanco*, etc. Count Odart describes the *Alexandria* as bearing round, and the *Moscatel* as bearing oval berries. In this State, I believe, there is little or no difference between what is sometimes called *Muscat of Alexandria*, *White Muscat*, and *Moscatel Gordo Blanco*. That there are differences in the so called *Muscats* I know very well, but I refer to those that are in popular use in the raisin vineyard.

Colonel Haraszthy imported, among others, the *Moscatel*; this was propagated widely throughout the State, but the places where it found lodgment are not now known from those that sheltered the *Alexandria*, with few exceptions. The distinctions of names appear to be lost, and vine-growers appear to be indiscriminately calling the same variety under both names. I believe that the so called *Alexandria* in most cases is the same as the so called *Gordo Blanco*.

A coincidence happens in the case of two different importations,

direct from Spain, of the *Gordo Blanco*. These were made by Mr. Wm. B. West of Stockton, and the Natoma Water and Mining Company of Folsom. In both cases the result was unsatisfactory, the fruit not equaling the variety we were already cultivating. In respect to the importation made by Mr. West, it should be said that the result obtained from propagating his imported variety appeared to differ in various places, and that it did not find a congenial home in Stockton. With the Natoma Company this was different, for with them the variety in general use was successful, while their imported stock was a failure, so far as the quantity of the crop was concerned.

Now, I am inclined to believe two things, viz.: that the so called *Moscatel Gordo Blanco*, *White Muscat*, and *Muscat of Alexandria*, where they show the same general characteristics, are all one and the same stock, and that if there is any apparent difference in them, it is due only to varying conditions of culture, pruning, and age of vine; and that the original stock of *Moscatel* came from a superior growth or sport, such as is not uncommon with other varieties. It is possible to perpetuate by cuttings the peculiar characteristics of a single branch of a grape vine; a good selection of cuttings resulting in superior and a bad selection in deteriorated vines. With the *Moscatel*, particularly, I believe we ought to use great care in the selection of cuttings.

The distinction as to oval and round berries may not be made as easily in practice as in theory; for I have frequently seen both kinds on the same cluster, and varying clusters on the same vine. Our popular *Moscatel* may be described, however, as an oval variety; in its perfection it shows its true form. My impression is that careful observation will reveal the true form in the well developed fruit that grows under the protection of the foliage and near or on the ground, where there is less desiccating influence and a free flow of sap. Hanging from the upright canes, in full exposure to the sun and dry winds, the berries appear to shrink longitudinally, and appear nearly globular. Raisins that dry on the vines in very hot climates shrink in the same manner, and become blunted in length. The finest specimens for raisin culture are produced on low vines, and from strong canes that grow either horizontally or depressed. In many places the vine is trained as others are, and there generally we are led to note an apparent difference between what they call *White Muscat* and the *Gordo Blanco*. It is more than probable that the distinction will disappear with a change of pruning and training. Some, who have purchased the *Gordo Blanco*, report no difference between it and their ordinary stock after they have cultivated them together under the same circumstances.

The English nurserymen have introduced varieties, produced from seedlings, which vary from the ordinary stock in size and shape of fruit, intensity of aroma, time of ripening, etc., according to report; but I have not yet verified these distinctions nor their relative value.

There is a variety, described in French ampelographies, called *Muscat Caminada*, named by Count Odart in honor of a Spanish Consul at Marseilles, who introduced it into France. Its origin is not known, but its merit is in early maturity, which fact caused the author named to rejoice at receiving it. Its habits are more regular than the *Gordo Blanco*; its canes are even in length, one not pushing out at the expense of others; comparatively weak in growth it is counseled to graft it on well selected vigorous stocks. It bursts its

bud late and so avoids late frosts. It is supposed to be the same variety *M. Tourrés de Tonneins* received from Portugal under the name *Muscat Orange*. Its canes are shorter and more stubby than those of the *Gordo Blanco*.

In the south of France there is recognized a variety called the *Panse Musquée*, which bears also the names *Muscat de Rome*, *Muscat d'Espagne*, *Muscat Grec*, and *Muscat d'Alexandrie*. Count Odart repels the name of *Panse* applied to this variety, because it has not the oval or olive-shaped berry of the *Panse* family. He gives it under the leading name of *Muscat d'Alexandrie*. If he is correct in this, then we are not cultivating it in our vineyards to any well known extent.

The *Moscatel Gordo Blanco* passes also under the names *Moscatel Gorron*, *Moscatel Romano*, in Spain, and in Italy, *Uva Salamanna*. So it is evident that the confusion is as great in France as here.

Properly, we should use the word *Muscat*, or *Moscatel*, instead of *Muscatel*, and more certainly to designate the raisin variety, or should call it either *Spanish*, or *Malaga Muscat*, to prevent confounding it with the large family of *Muscats* which are not suitable to raisin making, or we might agree to simply say *Gordo Blanco*.

Mr. Feely, of Santa Cruz County, has propagated a variety under the name of *Larga Bloom*. The name appears on its face a local incident, being a combination of Spanish and English. He informed me that it came from the collection of Mr. Crabb; but this is, probably, a mistake, as the latter says he did not have anything by that name. It differs in some respects from the *Gordo Blanco*, and, if I am not mistaken, resembles more the type of the true *Alexandria*, as described by Odart. There are some of these now growing in Fresno, where they can be compared with the *Gordo Blanco*. A report on their merits would be desirable.

I believe it would be most important for the raisin producers to make an effort to straighten out the true nomenclature of these vines, and to determine by practical tests where each is growing; then we may perhaps learn how much distinctive qualities are due to location and how much to variety.

I have seen samples of raisins made in Los Angeles County, from a variety called *White Malaga*, which certainly were not equal in quality to those from *Gordo Blancos*. This *White Malaga* may be the same grape as that known in Napa and elsewhere by the same name, but which is only used for wine purposes.

"Dried grapes" are beginning to be recognized commercially as distinct from raisins. They command a relatively low price for a limited trade, and are roughly handled and packed.

This commercial distinction should cause the name of raisin to be all the more jealously guarded, so that if any are offered as such it may be known at once that they are products of the *Gordo Blanco*; otherwise they should be called also by the name of the grape from which they are made.

The cultivation of the *Gordo Blanco* and its intimate varieties will be treated upon specially hereafter under the topic of *coulure*.

SULTANA.—This vine, called superfluously the "seedless" *Sultana*, is becoming generally popular; but we have not yet seen where it is destined to produce the best results for drying. Fortunately, it may be utilized for wine making, which cannot be well said of the *Gordo*

Blanco. A wag of a vine-grower from St. Helena said at Los Angeles last Summer, at the time of the District Viticultural Convention, that he was willing to encourage the planting of the *Sultana*, because it was a "temperance" grape, and that the "temperance" folks would all be making wine of it soon.

Its value for wine purposes will no doubt differ, as it is differently cultivated under varying conditions. It is folly to assume that it is a proper "sherry grape" until some satisfactorily merchantable product has been matured. Moreover, to make sherry we want not only the proper variety, but also the proper location. Such samples of wine as the State has accidentally produced, by keeping in warm places a stray barrel, have been from places where the wines were naturally well fermented, free from acid, and endowed with those peculiarities which do not favor acetic fermentation. We must try to arrive at a true comprehension of these properties before we pronounce in favor of a "sherry grape." I have seen wine made from the Mission grape, across the Mexican border, in Lower California, that when exposed to the atmosphere, with the bung open, could not be made into vinegar, but which, on the contrary, gradually improved by oxidation of the alcohol, and took on what is popularly called the sherry flavor. It is not sufficient to call this oxidized taste the only requisite of sherry, although it may be a marked characteristic of the type. If, however, this method of defining the type be adopted, and possibly it cannot be prevented, then we must recognize that there may be as many kinds of sherry as there are varieties of vines, which, under certain conditions and circumstances, will produce well fermented wine that may be subjected to atmospheric influences to mature them, with little chance of acetic alterations. I have, for instance, a barrel of white wine, fourteen per cent strong in alcohol, made by Mr. George West, of Stockton, from the *White Prolific* and *Moselle Riesling*, which I am experimenting with crudely after the manner of sherry breeding. The barrel is only about three fourths filled, the bung is generally open, and always loose, and the wine is subjected to the varying temperatures of a small room opening into my kitchen, where the temperature is frequently very warm, but never very cold, as it is protected by concrete walls. At first it showed perceptible traces of lactic acid, due to imperfect fermentation, but this seems disappearing, and as oxidation advances a marked, so called, "sherry" flavor is noticeably increasing. It will not turn to vinegar, becomes less acid all the time, and would be called now, as the word goes, a light pale sherry. It has been subjected to this treatment about eighteen months; when I desire to use any of it, I draw it through the bung as carelessly as I would so much spirit. I am of the opinion, however, that this wine owes this property to the place where it was grown, and not to the varieties of which it was made, as other wines from the same vineyard show similar durable characteristics. Sherry must, therefore, be considered as a local production, and its qualities will be controlled by the grapes that are fermented; it will not do to recommend any variety as a "sherry grape" for all localities. Indeed, if we desire to produce sherry in a place of known sherry predispositions, we should then apply the same rule of selection as to varieties that we do in respect to other established types of commercial reputation. If we desire to compete against fine Spanish sherry, wisdom should teach us to begin our experiments with those grapes that have made reputations for the

Spanish wines; and, inasmuch as we have made no material progress in that direction, notwithstanding the apparent sherry predispositions in some places, may we not have further reason to believe that our failure is due to the fact that we are not cultivating the proper Spanish varieties?

I deem this much important to say in this connection, because the *Sultana* has been selected by many, regardless of locality, as a "sherry grape," because there has been detected in it certain durable qualities, when exposed to the air. It may make, in proper places, one kind of so called sherry; but what will be its competitive advantages? We do not know.

Mr. Crabb, at Oakville, has samples of *Sultana* wine, made last year from his own vines, in Napa County; also some made of a Yolo County product, the latter having been an enormous yield per acre. These will be worth studying at our State Convention in December. I am informed that the Napa must fermented well, and kept clear; and that the Yolo product keeps troubled, probably from excess of albumen and mucilage. Possibly this latter defect may disappear with age. The best tests of its sherry qualities should be looked for where the *Mission* variety, which is so generally distributed that it may prove a guide for many purposes, has indicated the best results in that respect. Opportunities to make experiments from bearing vines are presented near Folsom, San Bernardino and Riverside, San Gabriel and Stockton, where the crops are of normal quantity, and where the maturity may be complete.

Sultana wine is known in the Orient; but that it has never been commercially compared with Spanish sherry is one good reason why we should not expect much more than to repeat history. We must not forget that in our generation it will be difficult to teach the public to favor new types. Our present policy should be to reproduce those types which are most favored by the world's markets, as nearly as we may, by taking advantage of the knowledge of the vines that yield them, when adapted to climate and soil. The next generation may have time to explore the open Polar Sea. We shall do our duty to our children if we establish possibilities by prudent and limited experiment, and acquire that prosperity through known and demonstrated agencies, which they will require to rest upon for support.

The *Sultanas*, which have been planted in rich bottom lands and in valleys, where their acid juices and little pulp prevail as grape characteristics, will probably be used for wine, and not for dry curing. It is too early yet, with this variety, to indicate under what circumstances good competitive *Sultanas* may be cured; the chances, however, are in favor of those places where sound, well-keeping, sweet, pulpy grapes are now obtained with average normal crops, and where watery and insipid juice is not noticeable in ordinary vintages. A natural drying or evaporating atmosphere will be one promising indication of success, because, as explained in the general discussion of vegetation, the same influence that assists in curing the fruit, is essential in maturing the fruit. The moisture of the soil, also, for such purposes, should not be such as to provoke vegetation beyond the period of maturity, and strict attention should be paid to the rules of pruning and the prevention of redundant growths.

The *Sultana* requires long pruning. It is usually trained according

to the system generally adopted at St. Helena for *Rieslings*, heretofore described. The Cazenave unilateral cordon would, no doubt, suit all its requirements in a climate of equable temperature; where hot dry winds prevail, it would probably produce better results trained in *chaintres*. Planting closer than ordinarily and limiting the pruning to one long cane, Guyot system, would probably be best for it when ample maturity is not easily obtained; the space between the rows should be open to the heat of the sun, hence the long cane should be trained in the directions northerly and southerly—an inclination towards southwest and northeast would be the best.

THE CORINTHS.—There are three varieties of the *Corinths*—white, red, and black. All of these are seedless by reputation; but, so far, experience shows that they rapidly change character in this State, and develop more or less large berries with seeds. When they thus change, they also lose their wonted compactness. What the cause of this change is has not been satisfactorily explained. If all the berries, as in the original compact and seedless conditions, should set well, the large berries with seeds could scarcely occur; therefore, I am inclined to believe that *coulure* is the primary cause of the change. If this be true, there will be more probability of preserving the seedless type where there is less *coulure* than elsewhere. Their home in Greece is not far from the influence of a gentle seacoast climate. The conditions of successful culture near the sea are best found along our extreme southern coast.

As *coulure* is very liable to attack vines on light loose granitic and gravelly alluvions, it would be best to experiment only to a very limited degree in such places, and especially to be guided somewhat by local successes in obtaining full compact bunches of *Muscats*.

It is probable, also, that the *Corinths* may be induced to set their berries compactly, if all rules respecting pruning, training, pinching, etc., be observed, and especially if excessive Spring vegetation be avoided. The *chaintre* system offers the simplest method of testing the effect of training and retarding rapid Spring vegetation, and by its long pruning would suit these varieties. Size of fruit is not so desirable with currants as with raisins, so the multiplication of the bunches on long fruit arms, with careful pinching before blooming on all shoots not needed for future fruit wood, may accomplish all desired results.

If we can succeed in producing currants profitably, the field of viticulture will be correspondingly enlarged.

Where irrigation is necessary, it would be well to practice it in Winter, avoiding it in Spring until after the fruit has set well, and when there is no danger of causing the berries to drop, and giving sufficient water for the Summer to develop one crop only, being careful to pinch all laterals. Where the soil retains moisture and Winter irrigation can be relied on, it would be well to avoid any irrigation after vegetation has begun. Sulphuring thoroughly soon after vegetation appears and again during the commencement of blooming, and repeating the operation in warm dry weather after rains or damp fogs occur, would assist in securing success. This sulphuring should, I believe, be practiced everywhere that *coulure* is in the least feared. Probably there is a greater tendency to produce seeds where there is much organic matter in the soil, or much rainfall, either of which

might furnish too much nitrogen. For this reason also I have predicted success on unirrigated red granitic loams of San Diego County.

TABLE AND SHIPPING GRAPES.

Under this head I shall, at present, write very little. We have, I believe, scarcely developed any positive knowledge on the subject of comprehensive nature. The descriptions of varieties of vines are fullest in the French books, but of shipping grapes, such as we may cultivate, France knows comparatively little. In all the books, I cannot recognize by description our *Flame Tokay*, *Emperor* and *Black Ferrar*. I can find no description of the *Leja* of Almeria, the well known green grape commonly imported in barrels from Spain. The *Black Prince* I have not yet located. From record and tradition, I am led to believe that there are many most valuable varieties to be found in Asia Minor, Persia, and countries even farther east, the possession of which would enrich us. If the State would send a competent person throughout those countries to gather specimens for us, the investment would, no doubt, be the most profitable one that could be undertaken for the benefit of our farmers. If some one of our wealthy men would devote, say twenty thousand dollars, to making such a collection, I will undertake to demonstrate to him that it would prove profitable to him, through the sale of vines and cuttings propagated. There are vineyards in this State now receiving an annual income of several thousand dollars from the sale of cuttings at ordinary prices. There are more varieties of vines grown in Italy than in France, yet we know very little about them.

Of the varieties now known in this State valuable for table and shipping purposes, we should make two classes, viz.:

First—Those which are best suited for the home and near markets;

Second—Those which are suited for long transportation.

It happens that those varieties which are the most palatable and delicate are not very durable; hence, these must stay at home, and will therefore have a limited market. It happens, also, that, even in the home market, grapes are often valued more for their appearance than for their delicacy and flavor. This last condition, I believe, will change with time.

FOR THE HOME MARKET.—Of varieties for real excellence, we have the several kinds of *Chasselas*, *Black Prince*, and *Moscatel*. The *Black Hamburg*, *Malvoisie* (black), and *Mission* are also valuable.

Of varieties serviceable for early and late pickings, but not of particular merits otherwise, are the *Sweetwater*, *Madeleine*, *Black July*, *St. Peters* (?) for early, and the *Verdal* for late fruit.

FOR DISTANT AS WELL AS HOME MARKETS.—Of good shipping and keeping varieties, suitable for long transportation, as well as filling certain local demands, we have the *Moscatel*, *Flame Tokay*, *Cornichon*, *Black Ferrar*, and *Emperor*. There are also some curious vines, such as the *Zabalskanskoï*, but we know little yet about their productive properties.

I am now testing the *Cinsaut*—an early black variety from the south of France, valuable both for wine and shipping. The same is being done at Folsom by the Natoma Company. Next year we shall know its period of ripening with us, and may test its shipping properties.

The *Aramon*, now being tested also in the same way, will probably prove of value as a table grape, as well as for the wine maker.

The *Loja* of Almeria is being tested, but gives unsatisfactory results generally, on account of *coulure*, and ripens too late for many places. Its home is near Malaga. It will prove a fortune as a late keeping variety wherever it succeeds well.

Some of the American varieties, such as *Isabella*, *Goethe*, etc., will always find a home market of limited extent, which should not be neglected. Few only, however, have yet been tested here. Mr. Crabb can show an interesting collection for those desiring to try them.

CAUTION.—Those who desire to produce table and shipping grapes should remember that transportation facilities are prime requisites; for the home markets, the vineyard should not be far from the centers of population, and should be on lines of easy and quick communication. For eastern markets, it should be on or near some grand trunk line of railway, and the planter should have enough products to make up carload lots. Wherever irrigation is necessary, it should be practiced so as to maintain the natural development of one good crop, avoiding unnecessary vegetation, and especially dilution of the sap during the period of ripening. Watery juices are not only insipid, but they also cause speedy shrinkage and decay. To avoid these troubles, grapes for shipping purposes should come, if possible, from places where warm, permeable, well drained subsoils permit perfect development and maturity. A subsoil of marl, or clay, that receives the roots, without plunging them into water, and maintains moisture by capillary attraction, would be most desirable.

MISCELLANEOUS NOTES.

The opportunity given me by the State Printer, to revise the proof sheets of this volume, will be taken to add some miscellaneous notes of recent observations made during the progress of the ripening of the vintage of this year (1884).

I find in the vicinity of St. Helena much confusion in naming the *Johannisberg* and *Franken Rieslings*. Those who are in doubt in identifying either should not rely on the general appearance of the foliage, or wood, but will find a true guide in making the distinctions in the appearance of the under side of the leaves, viz.: the under side of the *Johannisberg* leaf has a downy coating resembling woven wool; the *Franken* is generally free from down, sometimes showing only small detached woolly specks. The *Ampélographie Rhénane* classifies the *Franken* under the general title, *Espèce, feuille ronde* (round leaf species); this distinction may always be noted in the generally round leaves of the *Franken* on the light, bright green terminal portions of the canes before the vegetation acquires its rough, dark green, and crinkled appearance. The wine of the *Franken* does not show the positive aroma that characterizes the *Johannisberg*.

At Mr. Pellet's vineyard, near St. Helena, splendid illustrations of the capacity of the *Riesling* and *Colombar* to produce heavy crops, when trained on trellises, may be seen.

At Dunfillan, Mr. Drummond's vineyard near Glen Ellen, Sonoma County, the *Petite Syrah* may be seen trained both on high trellises and on ordinary high stakes. Both systems have been applied to

grafted vines of the same age, under similar circumstances of soil. The trellises are constructed of posts at each vine, eight feet high above the ground, with slats extending at right angles from the tops; long canes of last year's growth, ten to twelve feet long, are trained up the posts and along the high horizontal slats; the vigor of the new growth for next year's pruning is ample for the next pruning on the same plan; the vines are loaded with fruit. The vines supported by stakes about four feet high (above ground) are pruned to long canes—about four feet long—tied to the stake in curval form; these vines show a poor crop.

It is evident that, in good soils, vigorous rampant growers require a very large extent of branches and fruit canes to prevent *coulure* and to provide for normal development. In order to prevent uneven ripening, it is probable that wine grapes of such varieties should be trained as chaintres, or as unilateral cordons, and given sufficient space for large development. I would include among such the *Trousseau*, *Chauché Noir*, *Chauché Gris*, *Petite Syrah*, *Clairette*, *Marsanne*, *Johannisberg*, and *Franken Riesling*, and some others of similar habits on strong soils. Similar treatment, of more limited extent, would be favorable to the *Malbeck*, *Cabernet-Sauvignon*, Burgundy *Pinots*, *Meunier*, *Semillon* and *Sauvignon*, *Colombar*, *Folle Blanche*, *St. Helena Golden Chasselas* (see note on this variety). There are a few places also where the *Zinfandel*, on very fertile soil, rich in organic matter and potash, might be improved in this way. Table varieties, such as *Emperor*, *Loja* of Almeria, *Black Morocco*, *Sabalskanskoi*, and the *Corinths*, could be better managed on trellises, although they would do well in cordons and chaintres.

The principle involved in the preceding paragraphs is that some vines cannot be restrained in their growth without showing infertility; and some that are fertile under any treatment may be situated in certain soils, where extent of branches will avoid tendency to rotting of the fruit and such diseases as black knot, at the same time permitting free circulation of air and light, without which perfect and uniform ripening may be impossible.

At Dunfillan, Mr. Drummond has shown this year splendid crops on two year old grafts (on old *Mission* stocks) of the most shy bearing varieties, such as *Franc Pinot*, *Pinot Mourad*, *Pinot de Pernand*, *Chauché Noir*, *Malbeck*, *Cabernet Sauvignon*, *Franc Cabernet*, *Verdot*, and *Merlot*, and fair crops of *Chardenai* (*White Pinot*), and *Sauvignon Blanc*, by fastening long canes to high stakes—canes being curved, extremities bent downwards, proving incidentally that the Guyot system, which is more rational, would have produced likewise good results. In France, experience shows that the Burgundy *Pinots* do not retain fertility many years, but require to be renewed by burying the vines and starting new growth from the canes. Whether this will prove true also here remains to be proved; there is sufficient reason to doubt continued fertility to serve as a caution.

At both Mr. Drummond's and Mr. Crabb's vineyards, the *Gamay Noir*, *Gamay Nicholas*, *Gros Gamay*, and *Gamay Teinturier* are bearing well with short pruning. These varieties produce the wines of Macon and Beaujolais, which are good enough for the Paris market, and are commonly used there by travelers with apparent satisfaction. That they are not high classed in point of *finesse* does not prevent them from being popular. Their characteristics would indicate good blending with *Zinfandel* and *Chauché Noir*, and, being fertile with

short pruning, would satisfy those who wish to avoid high stakes, and who do not aim at the highest quality. The *Gamay Nicholas* should be preferred for quality, and the *Gamay Teinturier* solely for coloring.

The *Cabernet-Sauvignon*, for high classed red wines of Bordeaux type, should be ranked as king. This, and the Burgundy *Pinot*, are the two great varieties, which may stand alone, without demanding blending. When quality is considered, they are the typical French varieties for red wine; but they are only popular with planters to a limited extent in two comparatively small districts, owing to their light bearing capacities, and the practical difficulties of producing as fine results with them elsewhere. Three samples of wine, made from the *Cabernet-Sauvignon*, have been seen already, viz.: from J. H. Drummond, of Dunfillan, and Geo. Hood, of Guillicos—both places lying between Sonoma and Santa Rosa—and one from Mr. Crabb, of Oakville, Napa County. These samples have been pronounced by all who have seen them as of finer promise than any other young clarets seen in the State. In friable deep fertile soils of Napa and Sonoma Counties, we may, therefore, expect to produce a reproduction of fine Bordeaux clarets. This vine should, however, be given to fertile lands, with deep and good drainage, where atmospheric moisture is provided by sea-breezes, until experiment has proved further adaptability. On the deep fertile gravelly loams of Santa Clara County, especially in the range from Los Gatos to Mountain View, it would no doubt prosper and make fine wine, but of heavier body. It may also prove successful in the coast slopes of Santa Barbara, and on the sandy brush lands, moistened by sea atmosphere, along the coast of San Diego County from Encinitos to San Luis Rey. It is being tested in the Livermore Valley. At an altitude of twelve hundred to twenty-five hundred feet, in the Sierra foothills, on very fertile, deep, friable, and well drained soils, there is also reason to expect success with it; so, also, it should be preferred on the high slopes of Santa Cruz vineyards, with warm southern exposures. In Los Angeles County, it would probably prosper in regions of comparatively low altitude, subjected to the sea breezes, in fertile loamy lands, with moist subsoils. Surface irrigation in climates of great evaporation would probably induce great fertility, but would cause the wine to have an excess of albumen, mucilage, and other elements hostile to the perfect fermentation of a fine wine of true Médoc type; the dealers might, however, correct such defects by taking the wine when new—during the first Winter—and blending it with well-fermented dry wines possessing sufficient tartrates and tannin. The bitartrate of potash, and possibly other organic salts, appear to have almost if not as much influence in preserving wine from alterations as tannin. Those, however, who desire profitable returns from *Cabernets*, should expect to mature their wines in order to realize the advantage of quality, which is not extraordinary in young products, so far as the consumer's taste is concerned.

Examinations of many samples of merit in California show that the progress of maturing wine is much more rapid in our climate than in France, and that small packages, with the bung tight and turned to one side after one year, are greatly to be preferred to large tanks, which have to be constantly refilled at the top. *Cabernet* wine nursed and racked frequently the first year and then kept two years in bung-tight puncheons, turned so that the bung will always be under the liquid, in good cellars not exceeding sixty degrees in tem-

perature, would probably after six months in bottle satisfy here the demands of the connoisseur. Those who have suitable locations, and who feel prepared to meet these requirements, need not fear to plant *Cabernet-Sauvignon*, together with about one third *Verdot* and *Malbeck*, the *Verdot* to increase the tannin and the *Malbeck* to add that velvety character perceived by the palate, called by the French *moëlleux* or *velouté*. Such wines, well made and cared for, would at present bring higher prices in Bordeaux than in New York, because they would find established brands to carry them to market. The triumph of viticulture here will be when our large dealers will be compelled, by the demand of consumers, to purchase for distribution fine wines in bottle with established brands of individual producers.

The Burgundy *Pinots* will no doubt make fine wine on well drained warm deep sunny slopes of Napa and Sonoma Counties, but present indications point to the *Cabernet-Sauvignon* in preference; while the former has greater present promise of success on the warm lands and in the drier atmospheres of Santa Clara, Livermore, and Contra Costa slopes, especially at a little altitude above the low lands and overlying tertiary and cretaceous subsoils. Again, experience has already pointed out the high foothill soils of the Sierras for Burgundies of fine character; the red granitic and slaty loams should be selected in preference to the gray sandy deposits.

Both Mr. Drummond and Mr. Crabb have shown that the *Semillon* of the Sauterne varieties prospers, bears well, and yields fine white wine. The *Sauvignon* is needed to produce the Sauterne flavor and high character, but not in greater proportion than one third; this latter variety does not bear as well as the former. The fruit of these varieties should be ripened thoroughly before picking, an excess of sugar not being a fault. I have no hesitation in predicting success for these vines for rich full-bodied Sauterne types, in Santa Clara, Livermore, and Contra Costa Valleys, and, also, in the Sacramento and San Joaquin and Southern California districts, provided that in the latter districts, soils are selected which do not maintain about the roots of the vine, nor within their reach, an excess of water. In Governor Stanford's new vineyard in Tehama County, the high Sauterne type with excess of sugar is quite possible; so, also, in the vicinity of Stockton, where the rich marly subsoils already produce delicate sweetish wines. In the production of rich Sauternes, capable of being handled without fortification by spirits, we must probably look for conditions something similar to those which produce wines for sherry, conditions not easily explained, but found by experience. These conditions are known to exist in certain districts and not in others. Dry Sauternes could be produced in more places than the sweet. The sherry flavor may be prevented by preserving the wines from heat and oxidation in cellars of low temperature, and in coo-
perage always well filled.

Recent examination of the vine, formerly called *Merlau* at Mr. Schram's vineyard, above St. Helena, afterwards called *Pinot*, proves that it is identical with the *Chauché Noir*, and differing in the fruit from the so called *Black Riesling*. Mr. Wheeler's vine, near Bello, same county, is probably the same as Mr. Schram's *Black Riesling*. Those who wish to know the quality of the *Chauché Noir* for Napa hillsides and warm soils, may examine the wines of Mr. Schram and Captain Niebaum.

Crabb's Black Burgundy variety continues to give promise of quality;

good samples have been fermented separately by Mr. Crabb, R. M. Wheeler, and Professor Geo. Husmann, of Napa County—that of Professor Husmann having the richest body and color, from heavy clay soil within sight of the Bay of San Francisco. This variety is eminently adapted to the counties on the south side of the bay, and the high sierra foothills.

The *Tannat*, which I take pride in having introduced from the Hautes-Pyrénées in the south of France—is proving to be a treasure for the wine cellar. Samples, fermented at Oakville and Dunfillan, show a wine of claret type, with good tannin properties, and clean and neutral taste. It may be used for blends of fine wines without danger to quality. It bears well with medium long pruning. At Madiran in the Hautes-Pyrénées, it is associated with the *Mansenc* and a variety of *Pinot*, the latter I am not able to explain. It will probably be the best tannin variety to blend in fermentation with *Zinfandel* (picked at 22 per cent of sugar) and *Crabb's Black Burgundy*; or to blend, after fermentation, with *Burgundy Pinots*.

Of the two high coloring varieties tested and propagated by Mr. Crabb, *Gamay Teinturier* and *Pied de Perdrix* (probably the *Teinturier mâle*), the latter makes a wine unobjectionable in a blend of wine of quality, but it does not bear as well as the former, which makes rougher wine suitable to coarser blends. That the former is rightly named is proved by a more recent importation made by Mr. Drummond; it is a coarse *Gamay* with a red juice. *Pied de Perdrix* is one of the synonyms for the *Malbeck*, quite different from Mr. Crabb's vine. There is a *Tienturier mâle* and *femelle*; I believe that Mr. Crabb has the former.

I obtained cuttings of twenty-five *Bouschet* hybrids from the college at Montpellier, all of which have *Teinturier* stock in them. The most important appear to be the *Petit-Bouschet* (hybrid of *Teinturier* with *Aramon*), *Alicante-Bouschet* (hybrid of *Petit-Bouschet* with *Grenache*), and *Petit-Bouschet Morastel* (name signifying the hybrid). I have sent the former two to several parties to be tested; the Natoma Company has also imported the *Petit-Bouschet*. The *Alicante-Bouschet* is the most vigorous grower, and is showing signs of great fertility with me. The *Petit-Bouschet* is not so vigorous; Mr. Crabb and the Natoma Company, who had old vines to graft upon, show fertility with it. These varieties were obtained by hybridization to supply a want felt in Southern France for coloring stocks of great fertility and good quality, suitable for blending with good wines. This year will teach us more about them.

The *Mondeuse*, or *Gros Syrah*, is promising well for hot climates. It bears well, gives much tannin and color, and will be a fine companion for *Zinfandel* in Fresno and Southern California, as soon as sufficient stock is produced for scions and cuttings.

The *Clairvotte* is vigorous with the Natoma Company, also at Mr. Portal's, and my own place; it is subject to *coulure* from excessive vegetation, but is valued in the south of France as a white variety to assist in fermenting and improving red wines of late ripening, such as *Aramon*, *Morastel*, etc.; it will no doubt be serviceable to ferment with *Mataro*, *Grenache*, and *Carignan*.

The *Marsanne*, a white variety fermented with *Petite Syrah* in the Hermitage vineyards of France, when quantity is more considered than quality, is bearing heavily where I have seen it. Mr. Drummond has the same vine under the name *Metervie*, and Mr. Crabb

received it also under the name *Roussanne*; the latter name is a mistake as the *Roussanne* is also used in the Hermitage vineyards when quality is more desired than quantity.

The Spanish varieties obtained for the Natoma Company by Mr. Pohndorff from various parts of Spain, with one or two exceptions, appear to be very mixed. They will require very careful assortment, classification, and separate tests. The *Pedro Ximenes* is one of the exceptions and true to name. Mr. Pohndorff was especially desirous of introducing a certain variety that gives very highly colored wine known to commerce, but these collections show that such wines are produced from several varieties mixed, and we shall be obliged to experiment with them to determine the merits of each. There is one variety, common to several of the districts of Spain, as shown by these stocks, which, while ripening its fruit this year, shows great fertility and tannin. It appears to be allied in character to the *Mataro*, which originally came from Spain, but has looser berries. Among them are found, mixed with this vine, the *Grenache* and *Carignan*. I am inclined to think, especially after examining these collections, that the vine-growers of the south of France have already selected the best of the Spanish red wine varieties in the *Mataro*, *Carignan*, and *Grenache*, which we now know very well. The question of color is often local and may even depend on the method of fermentation as I shall discuss further on. In Roussillon a deep colored wine is obtained from the three varieties named.

A curious result of importing cuttings, "the best to be had," from Spain, is shown in the collections from Rioja. The Natoma Company sent some of each lot to Mr. Crabb, where they may be compared with others of his great collection. Examination of his fruiting grafts reveals the *Cabernet-Sauvignon* of the Médoc (Bordeaux) as the vine of Catala yud, Rioja; also, from the same district, the true *Sauvignon Blanc*, of the Sauterne, near Bordeaux. This may be accounted for as follows: The Empress Eugénie held large possessions in the Rioja district, which she planted in vines from Bordeaux, hoping to improve the quality of products thereby. Now we are obtaining the same varieties acclimated to a country more like our own. The fertility of Mr. Crabb's grafts from these Spanish stocks appears to indicate that a change of climate has benefited them, for they bear on short spurs better than the same stocks imported directly from Bordeaux. While investigating Spanish clarets in Paris, I learned that those of Rioja were the best and the only ones that might be safely transported through equatorial heats to California. How much this may have to do in determining what vines produced the class of Rioja wines recommended for shipment to this coast, I could not say, because there are other vines in Rioja, and wines of different grades. That the *Cabernet-Sauvignon* and *Sauvignon Blanc* were sent here as among the best varieties in that country, proves, however, that they preserve their reputation for quality, when cultivated in suitable places away from Bordeaux, and corroborates the essential argument running through the previous discussions.

Among the varieties worthy of special study at Mr. Crabb's, but which are not yet understood, is one which he received under the name of *Black Farmot*. It is fertile, and promises to make fine red wine. I cannot find any reference to it by that name in the Ampelographies. Another is the *Noir de Lorraine*, of Burgundy type, and very fertile. It differs from a variety imported by Mr. Drummond

under that name. The *Vignoble* refers to a confusion in this variety, and appears to find a place for both these stocks. Mr. Crabb has also propagated a seedling vine of his own production, which is, this year, very fertile. The berries are long, oval, and black; pulp firm and agreeably flavored; bunches about the size of the *Black Malvasia*, of which it is supposed to be an offspring. As a table and shipping variety for the season, when the Chasselas is disappearing, it might prove a valuable acquisition to Vacaville.

At Mr. Drummond's, the fine quality of the *Chasselas de Florence* and the beauty of the *Chasselas Rose de Negropont* are most attractive. The *Gros Colman* shows adaptability as a vigorous arbor vine. Two vines, apparently *Listan* or *Palomino blanco* (sherry variety), are bearing well. The *Enfariné* (French), a late black variety, celebrated for its tannin, is a fine bearer. The *St. Macaire* (name not in the *Ampelographies*) is a fine bearer, and promises to make good red wine. The *Verdot-Colon* is a heavier bearer than the ordinary or *Petit Verdot*. The *Gros Mancin* (*Mansenc*), an associate of Bordeaux clarets as well as of the *Tannat*, is a heavy bearer—ripens late, apparently later than *Zinfandel*. The *Kadarka*, the leading claret grape of Hungary, bears well, but is too late for Sonoma County. It would no doubt do well in warmer places. The *Baude* is an early fine, large, black grape, suitable for table use. The *Sicilien*, *Oseri du Taru*, and *Gradiška* are fine light tinted table varieties. There are many more in this collection which will fruit next year.

I have a vine in my collection which I believe will be valuable for warm regions. It came to me with a lot of seventy-five others from Montpellier, France; name, *Colombaud*. I was especially desirous to get it, having seen it growing in the south of France, and surviving all others of that region infected by phylloxera. It produces heavily, from white grapes, wine almost as colorless as water. I have a few young stocks commencing to bear. It would succeed in very stubborn soils.

The leading Portuguese port wine stocks, including *Bastardo* (our *Trousseau*), are doing well, but we have no samples of their wines yet to inspect.

Very good white wine has been made in two places from the *Herbemont* by Dr. Hyde and Prof. Husmann. The red wine was not as good as we demand. The *Lenoir* wine is already well known.

Grenache red wine on warm land in Napa County, yields more tannin and is firmer than was expected from its history. It differs from that made by Mr. Lefranc in Santa Clara County.

The *Mataro* has generally been picked before complete maturity in Napa County, and does not show its full color and tannin. At Mr. Schram's there is a sample maturing which already begins to reveal a fine delicate bouquet. The greatest usefulness of this vine is in blending either during or soon after fermentation with other red wines, especially those which are acid and deficient in tannin and clarify with difficulty, but it should have twenty-four per cent of sugar when picked. Where it will not attain perfection, other varieties, such as *Grosser-Blauer*, *Tannat*, etc., earlier ripening, should be used for similar purposes.

The value of the *Carignan*, when it thoroughly ripens, cannot be disputed. It is a proper intermediate between *Mataro* and *Grenache*, contributing acid and claret properties. But all these heavy bearing stocks require other blends to bring them to the light agreeable and

refreshing types required for table use. This point I shall discuss under the next topic.

Recent examination of my young bearing *Mondeuse* vines leads me to believe that this variety will ripen just in time for *Zinfandel*, and that it may be with great advantage added to vineyards, where the latter does not acquire color and tannin. It is a heavy bearer. It would most certainly be valuable to the Los Angeles vineyards. The *Petite Syrah* and *Cabernet-Sauvignon* appear to be companionable as to time of maturity; both a little later than *Zinfandel* with me this year, and coming in good time for *Mataro*. The *Clairnettes* are not yet ripening, while *Mataro* shows seventeen per cent of sugar. *Tannat*, *Zinfandel*, and *Malbeck* appear to be coming in together. There would be no doubt that these three varieties, together with *Colombar*, would constitute the elements for a superior claret; and that *Mataro*, *Petite Syrah*, *Cabernet-Sauvignon*, and *West's White Prolific* would make something worth age and bottling as a fine wine.

I regret that during the preparation of this volume I have not had an opportunity to inspect the collections of Professor Eisen and his brother at Fresno. I should have been most interested in his Spanish stocks.

I should not forget to remark that during the devastation this year by *coulure* of many (mostly table) varieties in the collection of Mrs. Jeanne C. Carr, at Pasadena, the St. Helena, so called *Golden Chasselas*, was spared, and was bearing heavily. I have, I think, good reason to believe that this will prove to be one of the Spanish sherry stocks, and its success at Pasadena should cause planters there to study it closely.

The *Orleans Riesling* has failed this year from *coulure* at Anaheim, and in rich alluvium near St. Helena. It is a variety that should not be grown where excessive vegetation in Spring is common. It sets well on dry warm slopes, in clay, or firm soil.

The *Franken Riesling* suffered much from *coulure* near St. Helena, while the *Johannisberg* escaped; pinching the growth on the long canes just before blooming would no doubt have avoided the difficulty, especially with sulphuring early, and also during the bloom.

I am informed by Mr. Arpad Haraszthy that the *Emperor* ripened well at the Orleans Hills Vineyard in the month of August this year, which is an unusual occurrence, and worthy of note.

THE INFLUENCE OF DIFFERENT VARIETIES UPON EACH OTHER IN FERMENTATION.

The economical study of ampelography involves us partly in matters of fermentation, because the establishment of the vineyard requires consideration of the proper selection of varieties, not only with reference to their peculiar qualities, when used separately or blended after fermentation, but also with reference to their influence upon each other when fermented together.

I have endeavored to suggest in many ways and from many stand-points the importance of attempting in each vineyard to produce, as nearly as is practicable, some one or more types of desirable products suitable for direct consumption. In many places this may be only approximated, but the aim should be to leave as few defects as possible for the wine dealer to supply. Some may, indeed, aim to produce specialties, such as high coloring, or tanniferous wines, to supply known deficiencies in certain districts, useful to the merchants, but

not directly for consumption. The latter case might apply, for instance, to certain districts in the State, now largely planted, where there may be general average deficiencies of color, tannin, and aroma. Time, however, will rapidly cure such defects, as the growers learn what proportions of different varieties they require, and obtain the same by grafting portions of their old stocks.

To produce desirable wines rarely more than five and seldom more than three varieties of vines for each type will be required; these, however, should be selected from among those which ripen at or nearly at the same time. Compromises between quantity and quality may be made to suit the notions of the producer, which may increase the number of varieties; in such cases it will generally be necessary for him to produce two or more distinct types for future blending.

Our present vineyards are generally planted without reference to associating the varieties in one type of wine; the varieties are often ill suited to each other and ripen at different times; the result is that the cellars contain generally many different wines, which are practically raw materials for the merchants to mature, blend, and make presentable to the consumer. Such a condition of affairs may work satisfactorily to the producer as long as demand for his goods exceeds supply, but it will place him in a sorry position whenever he is forced to hold a part of his stocks, for he may not have the necessary blends to render the process of maturing old wines in his own cellar profitable.

The custom of fermenting and holding all varieties separately also causes a great loss of useful elements which are not fully utilized, but which are thrown out in the marc or residue of the wine press. If a characteristic aroma is desired from one grape, a certain color from another, and a certain degree of tannin from another, separate fermentations will prove a great waste of material, which should be avoided, if possible. The skins of coloring varieties will yield more of their contents to a proper mixture of musts than to their own juice alone; so also with other properties.

There is a harmony of constituents, also, that cannot be obtained by blending matured wines at the time the consumer demands them. To acquire this they should either ferment together, or be blended soon after fermentation. Every new mixture causes new reactions to take place, and generally new fermentations. The less of such trouble that is thrown upon the dealer, the less will be the margin of profits deducted from the producers' income.

The principal rule in blending by the producer should, however, be, never to make any combinations that are not improvements; if he has common stocks, which would degrade others, while possibly being improved themselves, he should keep them separate, so as to let the demands of trade determine how they shall be used. This, of course, applies to stocks that are in sufficient quantities to keep separate.

The great question to-day turns on the improvement of the musts of those varieties which are most largely planted. New vineyards may strike out original lines to pursue, but the one hundred and fifty thousand acres already planted form a grand basis for calculation of necessary and appropriate improvements. For these established vineyards, we must study out the simplest remedies for existing defects.

Changes in present conditions of quality may be worked out in several ways :

First—The individual vineyard may be in some cases increased in size, such increase providing for certain wants.

Second—Certain portions of the vineyards may be grafted to desired varieties, taking care to graft upon the inferior stocks.

Third—The entire vineyard may be grafted over to produce either properly associated blends, or to supply demands created by defects in other vineyards.

Fourth—Those, planting new vineyards, may be influenced to some extent to plant varieties needed to perfect the wines of their neighbors, or to supply similar wants of the large dealers.

The exhibition and comparison of new and old wines of all grades, at our State and District Conventions, will reveal to the producers the actual condition, necessities, and possibilities of their industry. To make such comparisons, instructive reference should always be made to standard models of wines perfected for consumption, especially those of other countries against which we must compete. The producers should learn that such study is essential to their prosperity and they should enter upon it with zeal, frankness, persistence, and with minds free from prejudice; cordial coöperation should characterize this generation of vine-growers and wine makers. The merchants can assist greatly in elevating the average standard of the wines he deals in, but in many cases personal and temporary interest will prevent him from giving candid advice. The vine-grower and wine maker will be mainly dependent upon the information he may derive through coöperative and harmonious work. Experience with the markets will no doubt teach us all what to do in course of time, but such experience is often very costly. These remarks are made to suggest an earnest appeal for more zealous and generous coöperation in our future efforts on the part of all who are interested.

We may say, generally, that for dry red wines the bulk of our products from vines already planted will come from *Zinfandel*, *Malvasia*, *Charbono*, *Mataro*, *Grenache*, and *Carignan* in the bay counties, with, however, very unequal distribution of these stocks, *Zinfandel* predominating. Comparatively small proportions, but sufficient to affect the average result in dealers' hands, will come from *Trousseau*, *Chauché Noir* and *Crabb's Black Burgundy*. The percentages of *Malbeck* and *Lenoir* would be scarcely appreciable if put in with the general average; but they may be counted sufficient to affect the result in classifying wines for the trade. The proportions of nobler stocks, such as *Burgundy Pinot* and *Cabernet-Sauvignon*, together with the *Trousseaus*, *Chauché Noirs*, *Crabb's Black Burgundies*, *Meuniers*, *Malbecks*, together with scattering small fine lots suitable for blends, as they increase in quantity, will rapidly reach such sufficient quantity that they may be handled separately in a great measure by the trade, in a manner that will produce the best advantages. The great question will, therefore, soon resolve itself into the question of improving the more extensive *Zinfandel* stocks of Napa and Sonoma Counties, and the *Charbono* of Santa Clara. In the newly planted districts of Alameda County, opportunity to obtain available material for good blends has been seized in time.

For white wines in the districts near the Bay, *Rieslings*, *Golden Chasselas*, *Gutedel*, *Burger*, and *Colombar* prevail in varying proportions, and less difficulty is met with.

In the southern counties, the great bulk of red wine must come from *Mission*, *Zinfandel*, and *Malvasia*, with small but appreciable proportions of *Trousseau*. *Mataro*, *Carignan*, and *Grenache* have received considerable attention only by a few planters, whose products will not become blended with the general average. The question there is how to improve the *Zinfandels* and *Missions*.

For white wines in the south, *Mission*, *Burger*, *Blaue Elba*, and *Seedless Sultana* predominate, with isolated small proportions of *Colombar*, *Folle Blanche*, and *Orleans Riesling*. The fine varieties have a tendency to hold together with the new propagations that are being made. How to improve upon *Mission*, *Blaue Elba*, and *Burger*, is the main question.

In the interior Sacramento and San Joaquin districts, there are many new vineyards planted with material for fair blends, such as could be obtained; but the main question will be how to improve *Zinfandel*, *Malvasia*, and *Mission* red wines, and *Feher Szagos*, *Burger*, *Blaue Elba*, *Sultana*, and *Mission* whites.

In grafting any of these great stocks, the attack should be upon the *Missions*, *Malvasias*, and *Feher Szagos*, generally; in Santa Clara, upon *Missions* first, then *Charbonos* and *Malvasias*; in Napa, upon bottom land, *Zinfandels* and *Burgers*, *Malvasias* anywhere, and *Chauché gris*; in Sonoma, upon *Missions*, *Malvasias*, and such *Zinfandels* as fail to ripen well. In this way positive defects may be remedied, as negative ones are provided for by grafting.

With the exception of a few choice *Zinfandels*, requiring only such amendment as may be provided for by the use of a fair proportion of *Tannat*, and about ten per cent of some white grape of high quality, such as *Semillon* or *Colombar*, most stocks of that variety require companions to supply defects of tannin, color, and finesse, and to correct harshness and flavor. In selecting such, it will be best to find those that will ripen at the same time, so as to be fermented together in definite proportions. By following this rule, the proportions of new varieties need not be as great as they would need to be if fermented separately, and more rapid progress may be made.

Malvasias need some durable blends with plenty of tannin and some good solid white variety of good quality, to mask their decadence as they grow old. *Grosser Blauer*, and *Gamay Teinturier* (black varieties), with *Golden Chasselas*, and a little *Folle Blanche*, might accomplish, with the *Malvasia*, a fair result. Finer varieties would be wasted in such company.

The *Zinfandel*, when from sufficiently matured fruit, is worthy of most careful study in selecting associates. Inasmuch as it may be easily harmonized with several fine varieties of different types, others should be selected to preserve harmony. For light bodied claret types, I would suggest experiments with *Tannat*, *Malbeck*, and *Chauché Noir*, with about ten per cent of *Colombar*, aiming to pick the *Zinfandel* at about twenty-two per cent of sugar, so as to correct any over maturity of any of the others. For a heavier bodied wine, suitable for drinking with water freely mixed at meals, I would try, if possible, to obtain them suitably ripened at the same time, *Mataro*, with a small part of well ripened *Semillon*, or *Colombar*, corrected for over maturity, if necessary, by *Folle Blanche*, providing for any deficiency of color with *Lenoir*. For a fair *Burgundy* expression, I would try *Tannat*, *Crabb's Black Burgundy*, *Gamay Nicholas*, and *Trousseau*, picking the *Zinfandel* at twenty-two per cent of sugar, to

balance over ripeness, and to preserve an agreeable sub-acid flavor. A modifying blend of *Malbeck* in all cases would probably be most beneficial to *Zinfandel*, to correct harshness to the palate. A great improvement on most *Zinfandels* could also be probably made by fermenting it with ten per cent of *Grosser Blauer* and twenty per cent of *Colombar*, adding *Lenoir* to correct harshness and color.

Charbonos in Santa Clara County may be improved by association with *Trousseau*, *Crabb's Black Burgundy*, a little *Grosser Blauer*, or *Tannat* and *Colombar*, lightened by *Folle Blanche*.

Missions, where sweet port is the object, may be improved greatly by blending after fermentation with sweet *Trousseau*. Very ripe *Mataro* and *Grenache* might be fermented with the *Mission*, the former adding durability and the latter finesse. Where sherry types are desired of such quality as is possible, the use of *West's White Prolific* and *Verdelho* would add quality. For dry white wine the *Colombaud*, *Clairette*, and *Burger*, fermented with the *Mission*, would no doubt render great assistance, especially if afterwards blended with a light white *Zinfandel*, which will be plentiful in most places where the *Mission* is found. For brandy ferment *Burger*, *West's White Prolific*, *Folle Blanche*, and *Colombar* with the *Mission*, picked before full maturity, fermented *without the skins*, and distilled immediately. A small percentage of *Muscat of Frontignan* might be added with advantage. Brandy distilled from juice fermented on the skins should not be mixed with the better grade, but kept separately for rough trade, or converted into neutral spirits.

For *Zinfandels* in Fresno and other places, where excess of saccharine is usual, it would be well to provide at once a large percentage of *Mataro*, *Burger*, and *Folle Blanche*, correcting color and harshness with *Lenoir*. As soon as tested, we shall probably find the *Clairette* a suitable white blend in the fermentation of such red wines, and the *Petit-Bouschet* and *Alicante-Bouschet* superior in quality for color. I am also of the opinion that a certain percentage of *West's White Prolific* would add durability to such combinations. The *Mondeuse*, as a red variety with tannin, would no doubt also be desirable. The history of the *Mataro* points to it as the first selection to assist fermentation and impart durability.

For the *Feher Szagos*, attempts should be made at once to raise its sherry quality in Fresno by grafting as rapidly as possible proportions of *Pedro Ximenes* and *Listan* (*Palomino Blanco*); a good percentage also of *Verdelho* would be of value to the quality. In the absence of these varieties, I would try *West's White Prolific* and a vine which is called in Napa County *Chasselas de Foy* (no doubt incorrectly, as it has no *Chasselas* characteristics).

To improve Angelicas and other sweet light colored wines, certain improvement can be made by obtaining proportions of *Verdelho*, *Pedro Ximenes*, and *Maccabeo*.

For the Muscat type of sweet wines, plant only the *Frontignan*.

To improve the *Rieslings*, increase the true *Johannisberg* (the variety with woolly appearance on the under side of the leaf), suppress the *Chauché gris*, and add the *Kleinberger* and *Moselle* (*Klein Rüsschling*) to the *Franken*.

To improve the *Burgers*, suppress those on low lands where perfect maturity is not obtained and add the *Colombar* with a trace of *Muscatteller*; better still, add to good *Burger* about one fourth part of *Semillon* and true *Sauvignon blanc*, making thereby a light table

Sauterne. For a light breakfast wine *Burger* and *Folle Blanche* with a little *Sauvignon blanc* would make an agreeable combination. With *Burgers*, however, it would be difficult in case of making light wines to ferment varieties together, owing to the lateness of its ripening; for heavier wines this would not be objectionable, if the other varieties can be kept from spoiling on the vines. An excess of maturity of white grapes would not be such a defect as in varieties for dry red wines.

I do not attempt to touch upon blends for new vineyards; circumstances vary so greatly that individual cases must be considered separately. In suggesting the foregoing, I make them subject to the tests of experiment, knowing well how many more of like character may be proposed, but keeping in mind the lessons of actual experience and the commercial models we need to approximate.

I have overlooked, heretofore, proper mention of the *Verdal* as a heavy bearing, light, white variety of more than ordinary quality for very warm regions. It might be associated with white Mission wines in the south to advantage.

Further experiments with varieties recently imported will soon add much to our knowledge of useful blends; in the meantime I have no hesitation to suggest improvements in the lines proposed.

Future plantings in all good locations should be made, more or less, with reference to the stocks already in the field. Those who fear overproduction may ease their minds by reflecting on the fact that there are yet no systematically planted vineyards of *Médoc* (Bordeaux), *Sauterne*, *Burgundy* (*Côte d'Or*), *Sherry*, or *Madeira* types, and stocks of cuttings are being propagated with comparatively slow progress. Resistant vines may however, be procured, and be suffered to grow, while scions for grafting are being used. "There is plenty of room in the upper stories" of viticulture. While we are pleading for better cellarage, our effort metaphorically is to get out of the cellar into the more cheerful dining-room, and those who work upwards will find, as in all things of life, the least competition. People get crowded in going "down stairs."

WHITE GRAPES WITH RED WINES.

In the preceding discussion I have frequently suggested the association of white grapes with the dark varieties for red wines. Many do not know that most ordinary red wines are improved as clarets by blends with suitable white wines. I have, heretofore, alluded to the Bordeaux practice of using light cheap white wine, made principally from *Folle Blanche*, in blends of heavy Spanish and Roussillon red wines with certain proportions of rough Bordeaux types, constructing thereby the acceptable cheap "cargo clarets" of general commerce, which pass under fancy labels to the consumer. Without the light wines the resulting blend could not be obtained. Outside of the true *Médocs* and *Burgundies*, the clarets of France are nearly all composed in part of white grapes, combined either during or after fermentation, before reaching the consumer. Wines of reputed quality are well known to be produced by fermenting white and black grapes together. The famous *Hermitage* wines are made from *Petite-Syrah* (black) with *Roussanne* and *Marsanne* (white); so, also, the equally celebrated *Côte-Rotie* is made from *Sérine* (same as *Petite-Syrah*) and *Viognier* (white). In the *Hérault* the white and rose colored *Clairettes*

go into the vat with the black *Aramon*, etc. In Madeira the white *Verdelho* goes together with dark varieties.

In our own State, our wine makers frequently aid fermentation of red wines by adding *Burgers*; and all our dealers know the value of blending delicate sprightly white wines with harsh and dull clarets.

There is a principle involved in this question of more importance than mere expediency.

Those who can read French should turn to the chapter of Dr. Guyot's works in which he treats of the vineyards in the vicinity of Gaude, on the Mediterranean slopes of the Alps. He describes the wine made there from the *Panéa* and *Braquet*, black varieties, and the *Clairrette*, white and rose colored.

This wine of Gaude is remarkable for its color, strength, flavor, bouquet, and its tonic and wholesome properties, after being matured five or six years. It is very durable and brings a high price as soon as it is made. In discussing this wine, he attributes the high degree of color to the action of the must of the *Clairrette* on that of the black varieties during fermentation. He cites instances of like nature elsewhere, as, for instance, where, in his experience, a fifth part of white *Mozac* or *Jurançon* grapes with four fifths of *Malbeck*, *Cabernet*, etc., produces more color than the black varieties alone; also the same result with one fifth part of white *Pinot* with four fifths black *Pinot* or *Gamay*. His opinion is that the increase of color is due to the sweet musts of the white varieties, sugar aiding rapid and warm fermentation and dissolving the coloring matter. The wine of Gaude completes its fermentation in eighty hours and does not require to be left on the skins to acquire intense color.

He cites in support of his theory the fact that, if pure water be put on red wine pomace, it will scarcely color; if the water contains eight per cent of sugar, it colors like the first wine drawn off; if it contains twelve per cent of sugar, it obtains double the color, as soon as the fermentation has ceased. Heat, derived from rapid fermentation, also tends to dissolve the coloring matter; and he holds that the more rapid the fermentation, the greater the color will be.

As to the superior keeping qualities of these wines, he attributes the result to the more rapid and perfect fermentation, caused by white grapes of high fermentative qualities. He concludes as follows: "I leave these considerations to vine-growers, inviting them on their side to make researches, as I will do on mine; and, in a few years, we shall have conquered, without using gypsum or other foreign substances, the most perfect degree of color, and the greatest durability possible."

I have studied this question sufficiently to cause me to believe that our red wines may be more perfectly fermented, increased in color, and rendered safer for transportation, as well as finer to the palate, by proper blends in fermentation with suitable white grapes. This discussion also suggests the folly of adding water to over-ripe red musts, when white grapes would accomplish better results. I can do no better than to imitate Doctor Guyot in leaving the question with wine growers for experiment, having already arranged to conduct some in this direction myself. The problem is to find the best white varieties for the blends required; possibly some might not assist the fermentation, and it is also a question of quality.

The comments of Dr. Guyot, on the wine of Gaude, may be defective in not attributing a share of the quality of durability to one or

both of the black varieties entering into the composition, because we know well that such quality resides in certain other dark grapes, notably the *Mataro*, *Cabernet*, and *Trousseau*. We know, also, that many white varieties, rich in sugar, produce wine that cannot be well preserved in transportation without fortification, while such as the *Semillon* and *Sauvignon*, of Sauterne, are easily handled by trade, even when the saccharine is excessive, without fortification. We have seen similar results in this State with certain local samples, but where there is a deficiency of tannin, as in all white wines, we may not be sure that these properties, similar as to constitution to sherry characteristics, are not wholly due to certain local influences of climate or soil, or both combined. The weight of experience should lead us to rely on certain properties, derived from the skins and seeds in fermentation, peculiar to a certain comparatively small number of black varieties, such as *Mataro*, *Cabernet*, *Trousseau*, *Mondeuse*, *Beclan*, *Tannat*, *Verdot*, *Petite-Syrah*, and some others in less proportion. To illustrate, from a local experience: I have kept in my office for eighteen months a bottle of new wine made from wild grapes of the *Vitis Californica*, by Mr. C. Mottier of Harbin's Springs, after it had been more than two thirds emptied, without discovering the least trace of acetic acid or other disease; it contained only ten per cent of alcohol. I intend to preserve some *Californica* vines, propagated from cuttings of most fertile vines, for the sake of their fruit, to blend in fermentation with other varieties. If the result, as to quality, should prove undesirable I can graft them later. I would advise others to try the same experiment. I think they will require long pruning on trellises or the *chaintre* system of training. Mr. Pohndorff has preserved a sample of the same *Californica* wine, and finds positive evidences of high quality with age. An easy way to test this question would be to gather a lot of wild grapes, well ripened, carefully removing all unripe and defective berries, and ferment them together with *Zinfandel*; also, for another test, with some good white variety then in proper condition, and containing at least twenty-four per cent of sugar.

PART VI.

DISEASES AND PESTS.

The manual of Professor Foex, translated for my first annual report, is again referred to for many particulars under this head. Our vine-growers should give close attention to these publications, which are based on actual experience and the study of high authorities. This is especially true concerning the practice of sulphuring; neglect to receive information that has been published having already retarded progress in many places.

Concerning the phylloxera, there is nothing important to add to what has been published heretofore, and the remarks contained in Part I of this volume.

COULURE.—This affliction of the vine may be said to be both constitutional and accidental. Some varieties are always predisposed to it; others only suffer from unusual exposure to occasional disturbances in the physical conditions under which they vegetate.

Its manifestation may happen during the blooming period, or soon after the incipient berries are formed; in the first case, it is coulure of the bloom; in the second, of the fruit. It is often called a "blight," by our people; but this term is not sufficiently technical for general use.

It is especially dreaded in all countries where sudden climatic changes are common. Pathologically speaking, it is generally the result of diseased conditions of vegetation induced by a want of proper nutrition. I have already discussed the conflict for the possession and appropriation of plant food that takes place between the extending foliage and the organs of the fruit. Constitutional coulure characterizes those varieties whose foliaceous parts have a constant tendency, unless most favorably situated, to overpower the fruiting organs by robbing them of their necessary share of sap, or, as it may equally be true, where the functions of fruiting are feeble and require assistance. Absolute sterility in some cases is the result of either or both constitutional and accidental phases of the disease.

In Europe this subject has been much studied, the remedies applied proving the theories advanced.

In some cases, accidental coulure is traced to excessive moisture in the soil during the Spring; the result being, first, excessive vegetation and poverty of sap; second, dropping of the bloom without the formation of fruit, or of more or less of the fruit immediately or soon after it is formed. The remedy is drainage, the effect of which is warmer soil, moisture enriched with plant food, and a wholesome flow of sap, properly elaborated and evaporated of portions of its water. The fruit organs are nourished and establish the berries firmly.

In some cases it is traced to excess of humidity in the atmosphere,

which, with more or less excessive moisture in the soil, and rapid vegetation, prevents evaporation from the leaves, and, generally, by withholding light and heat, causes a weakly elaboration of organic matter in the sap. The sickly growths made under such circumstances are well known to all observing cultivators. The poverty of the sap is apparent. The remedy in such cases is either to retard vegetation so as to pass through such periods safely, if practicable, by furnishing a free flow for poor sap without forcing out all the fruit buds, some of which may be reserved until the sap has been enriched, or the unfavorable season is passed. Pinching the sickly growth may, except in extreme cases of long continued humidity, coolness, and obscured skies, throw what nutriment there is in the sap back for the better support of the organs already developed, and so strengthen them. Arresting the appropriation of all the nutriment by the foliage, is the principle involved. However, very unfavorable weather may be of such infrequent occurrence that the disaster has not been foreseen, and no provision has been made in pruning for retarding the development of all the fruit buds. In such cases little can be done, except to pinch the shoots and trust in providential nature.

In some cases it is traced to too close pruning, a moist and warm Spring and consequent excessive force of vegetation, which robs the bloom of nutriment. The remedy is pinching the shoots that are not required to make wood for the next crop, the operation being done as I have heretofore explained in Part IV, as soon as two leaves beyond the last fruit sign have appeared. The next Winter care must be taken to prune the vine according to its vigor, so as not to force excessive growth of shoots in the Spring. The pinching prevents the foliage from robbing the bloom and the leaves already formed throw back elaborated sap to support development. Girdling the young shoot, or the wood on which it grows, below the fruit, will also assist the blooming process by concentrating all the sap enriched by the leaves and by evaporation within the shoot—preventing it from passing downward through the cambium to the roots. To accomplish this operation a circle of bark about a sixteenth of an inch in width is cut away by an instrument made for that purpose. When long fruit canes are left in pruning girdling once at a point that will not interfere with wood required for next year will answer the purpose for all the shoots developing on the branch. No girdling should ever be practiced between any wood required for next year and the root system; only that which is to be cut away can be treated in this way. The effect of pinching and girdling is to enlarge the fruit development and hasten maturity. Girdling, or annular incision, is not extensively practiced anywhere except for table fruit. I have read some good authority for the statement that the quality of wine grapes is not injured by the practice; but there appears to be some doubt on the subject. It is also doubted by some whether the root system may not suffer from being deprived of a share of its usual supply of nutriment.

In some cases, accidental *coulure* is traced to poverty of fertilizing material, or moisture in the soil; the sap in the one case is too poor, and in the other it is not supplied with sufficient force. The remedies are self evident.

I have, myself, seen a plain case of *coulure* of the simplest form. The vine was tested with excessively long canes, two at least twelve feet long, bent horizontally and turned up at the extremity. The

buds developed at the extremities and at the upper parts of accidental undulations in the horizontal line. These shoots all showed full fruit signs. The extremity was then suppressed, in order to force out the rest of the buds along the horizontal. The sap was taxed too much, and slow development followed, and when the later shoots appeared they had only tendrils in place of fruit organs. The situation was a cool one, and the flow of sap was not normally strong. It appears, therefore, that, while confining the flow to too small a number of buds may cause *coulure* from excessive vegetation, the contrary circumstances may cause the same result by failing to form the organs of fruiting, or there may be some occult operation which in such causes forces out shoots from the infertile eyes. I note this experiment as having an indirect bearing on the question.

In cases of constitutional *coulure* the remedy is in pinching systematically before blooming. Take note of the rules for the preservation of wood for the next year, as explained heretofore. Girdling may also be practiced. The latter remedy is sometimes applied to olive trees, for like reasons. I intend next year, if opportunity offers, to experiment on the almond. The *Clairette* is a vine in the south of France which is so subject to *coulure* that pinching is systematically practiced, especially on rich alluvions. Its vigor of vegetation is very great, as I can attest by some that I am propagating.

Knowing how the sap of the vine is enriched, as I have already discussed fully, it is easy to interpret the manifestations of *coulure* in the light of experience and the nature of the effective remedies.

There are some cases where the affliction is evidently caused by sudden changes of temperature and sun scalds. Such accidents may happen in so many ways that it would be impracticable to indicate the remedies; and sometimes the evil may be beyond human control. A suffering, sickly, watery growth must always be a warning, and the possible remedy for a probable disaster is indicated by a knowledge of the condition of the sap in the vine.

Coulure of the fruit may be caused by sudden changes of temperature and moisture as may withdraw nutriment, or wither a tender development. This can scarcely be provided against, except by guarding the vine from excessive development of the shoots on the fruit branches before blooming, and by careful pinching of the laterals; by avoiding irrigation during these critical periods; by perfect drainage, and by pruning so as to admit free circulation of light and air, thereby promoting healthful growth and fortifying the tissues against inclement weather.

Last year, in this State, *coulure* was caused by desiccating and burning north winds, coming at a time when the fruit was in many places well advanced. There would be no way to avoid such disasters, which are very uncommon, except by providing sheltering groves, and by practicing systematically those methods of pruning, pinching, draining, etc., which tend to fortify the young vegetation and fruit with an abundance of good sap and firm tissue.

That fungoid germs prey upon delicate, watery, feeble tissues of the vine is inferentially proved by the efficacy of sulphur in more or less arresting *coulure* of the bloom and in hastening the maturity of the crop. That tender watery growths may be more easily attacked is proved by the fact that *oidium* makes most progress on the rapidly growing shoots and long-jointed suckers. Feeble and poorly nourished fruit organs, which show the most delicate forms in the stems of the

flowering buds and in the flowers themselves, are, no doubt, easily affected when not fortified by strong tissues and organic matter duly elaborated. It is possible that these delicate forms may be preserved, even though poorly nourished, through humid and cloudy and cool weather, until light and heat develop through their natural functions the necessary organic food and the atmosphere has evaporated excessive engorgement of watery sap, provided the fungoid germs may be kept from fastening upon them. The use of sulphur during blooming is therefore supported by theory, as it is in practice by results.

The rule of sulphuring during the blooming was published in my report for 1881, page 58. Experiments made by Miss Austin, at Fresno, on *Muscats*, prove its efficiency in diminishing *coulure*. Examination of the decaying blooms on vines not so treated, show fungoid manifestations, which, however, have not yet been scientifically explained.

Professor Ladrey says:

We have said that besides the action exercised by sulphur against *oidium*, its use, long continued, has a very favorable influence on vegetation and advances maturity. The observations made by M. Marés, at Launac, with reference to the opening of vintage in his vineyard, establish this result very clearly.

We have prepared in two columns a table showing the dates of the beginning of his vintage from 1838 to 1872, as follows:

Year.	Opening of Vintage.	Year.	Opening of Vintage.
1838	October 1	1854	September 8
1839	September 25	1855	September 15
1840	September 19	1856	September 15
1841	September 20	1857	September 14
1842	September 16	1858	September 6
1843	September 25	1859	September 1
1844	September 19	1860	September 12
1845	September 22	1861	September 12
1846	September 17	1862	September 3
1847	September 13	1863	August 31
1848	September 21	1864	August 29
1849	September 14	1865	September 4
1850	September 18	1866	September 4
1851	September 19	1867	August 27
1852	September 21	1868	September 1
1853	September 19	1869	September 6
		1870	August 29
		1871	September 7
		1872	September 5

Sulphuring was commenced at Launac in 1854; therefore the first column, from 1838 to 1853, comprises the dates of the opening of the vintages during the time when no sulphuring was practiced; while the second, from 1854 to 1872, shows the period during which the practice was regular. * * *

This result has been generally observed in the Department of Hérault. Since the vineyards have been sulphured the vintages have become earlier, and have been advanced an average of ten days.

These facts should be studied with interest, by raisin makers especially, who are not only troubled, more or less, with *coulure*, but also by the lateness of maturity.

That proper fertilizing may also have a tendency to check the disposition to *coulure* seems reasonable, and is supported by the evidence taken from thin, light, sandy, gravelly, and granitic alluvions, as compared with deposits in the same regions which contain more

loam and show more fertility. To be of special benefit to the vine during the Spring vegetation, the fertilizer should be immediately soluble and ready for assimilation, and should contain the elements most needed, including organic matter. When it should be applied requires some consideration of the nature of the soil and the rainfall, or method of irrigation. In light loose soils it would probably be best to make the application about the time that the buds begin to swell. If made earlier the material might be diluted and washed too deeply to be of immediate advantage. If scattered in the bottom of the plow furrow, and immediately covered, while there is moisture to carry it to the surface roots, the effect would probably be most noticeable in the early vegetation. Where the soil is firm, and there is little rain, an earlier application would, no doubt, be more serviceable; and, when irrigation is practiced, the cultivator can control it at the proper time—just before the time for the buds to swell. Superphosphates, ashes, guano, or nitrates of potash and soda, carbonate of lime, gypsum, and sulphate of iron, would be indicated as the best materials for the purpose. A light annual dressing of this kind would, I believe, be of immense value to the *Muscat* grower; and, if carefully applied, it would not be very expensive.

COULURE OF MOSCATELS THE PRESENT YEAR; METHODS SUGGESTED FOR ITS PREVENTION IN FUTURE.—In discussing general principles, the application of which have such manifold bearings, I have no doubt overlooked many possible contingencies and modifying circumstances which should have been referred to. It would be folly if I should assume to have perfected investigations, or to have compiled all the information that is obtainable. I am in hopes that this volume will be the means of bringing the Commission into possession of many new facts, and of perfecting the statement of general principles. Those who may obtain some advantage from the studies we are making, and, also, those to whom our instructions contain nothing new, are most earnestly invited to assist us in our efforts to compile and publish all the knowledge that may be useful to the viticulturists of California. By sincere coöperation greater progress will be made to the advantage of all concerned.

I am indebted to the courtesies, advice, and counsel of a large number of vine-growers for assistance in making this year a special study of the *Moscatel* variety, on which our market for table grapes and raisins will greatly depend.

This variety has shown this year, in many places, its constitutional predisposition to coulure to such a degree that a most favorable opportunity for commencing a study of the subject, with practical objects in view, has been presented. The State is, however, so vast in extent, and this culture has been so widely distributed, that I have been unable to personally inspect the vines at the proper period in many places. The work is, therefore, in a measure incomplete, although the most important sections have been carefully studied. I shall summarize the results of observations without giving unnecessary details.

The climatic circumstances favorable to *coulure* were more intensified in the Counties of Los Angeles, San Bernardino, and San Diego during the last Spring, owing to excessive Winter and Spring rains, than usual; the season in this respect has been unprecedented within our knowledge, and may not in our time be repeated. Other parts

of the State also experienced more than the usual fall of rain during the period of early vegetation of the vine, but differences of climate have induced somewhat varying results.

Throughout Southern California the vegetation started early and was not checked by any fall of temperature. Meanwhile frequent rains added constantly to the great quantity of moisture already accumulated in the soil. In the vicinity of Riverside the soaking of the soil was less than in San Diego and Los Angeles Counties, but the average results, differences of soils and drainage considered, did not materially vary.

On well drained warm lands, especially those sloping and in benches above the light alluvions, where the soil is firm, containing a fair proportion of clay and usually fertile, *coulure* of the bloom on the first main shoots (first crop) was more or less perceptible everywhere, but not sufficiently disastrous to prevent a profitable yield. This class of lands comprised not only the red granitic loams, but also those containing more or less black loam and washed gravel, and adobe or rich black clay.

On alluvial lands, with well drained subsoils, and surface soils rich in fine mold, not sandy or gravelly as compared with what are known as such, fair setting of first crop was observable, with streaks of almost total failure where there was evidence of light sandy washes.

On both the preceding classes of land, which were not well drained, and especially where they were situated so as to catch surface water by drainage, the *coulure* had destroyed almost the entire first crop.

On light deep sandy, gravelly, and granitic soils, holding little apparent mold and clay, especially when extremely porous, the first crop was practically an entire failure everywhere.

Altitude and proximity, or distance from the sea, showed no differences in these results. West of Los Angeles, under the full influence of the sea air, a good first crop had set on adobe land; so, also, at Orange, on rich gravelly loam; at Riverside, on rich granitic loam benches, and on rich alluvium near San Bernardino. On the Riverside benches, as the soil was found lighter, the *coulure* increased; so, also, it was very severe in low places receiving surface water in excess.

The light loose sandy and gravelly lands near San Bernardino, Duarte, San Gabriel, and Pasadena, all showed practically complete failures.

In San Diego County, near Apex, where about fifty inches of rain fell during the season, and where the sun was obscured by rain clouds during nearly all the time of early vegetation and blooming, on comparatively light granitic loam, the vegetation was rapid and sickly; some shoots were withered as if by frost at their tips, probably by the effect of bright suns in intervals of cloudy weather; some shoots decayed on the vines; the first crop was badly blighted in the bloom; army worms afterwards became a pest; the dormant eyes in many cases have produced a new crop, but many of the bunches show small seedless berries mixed with the large ones.

The second crop on the laterals appears to have set very well on all kinds of soil. This, by inquiry, I find to be the rule of every season. Also, I find it is a general rule that the *Moscateles* are subject, more or less, to *coulure* each year in light, sandy, granitic, and gravelly alluvions; but that in well drained warm soils, of firm composition, containing more or less clay, they give good results with regularity.

Young vines, four or five years old, that had been well pruned, at Riverside, on bench lands of best quality, showed good crops; on similar soil, old vines, that had been cut back severely, mutilated and pruned comparatively closely, showed vigorous growth, but had suffered severely in the first crop, while the second crop was setting well. Old vines that had been formerly severely Summer pruned, and then revived by being permitted normal development, and pruned to carry a good crop, showed comparatively little *coulure*.

Young vines, just coming into bearing, having been neglected in pruning and consequently showing many shoots, were generally setting their fruit, although in one of the most sandy and porous loose soils, near San Bernardino, they had failed. In the latter case, the foliage had turned yellowish during the latest rains, recovering their healthfulness after warm dry weather has continued for some time.

Where there had been neglect in plowing and cultivating, and where the vegetation had consequently been less rank, early and watery, the fruit had set fairly.

On light sandy soils it was reported that the vines started first into vegetation and made the most rank growth early in the season, but bloomed later than those vegetated more normally on rich firm soils.

Considering all of these facts, together with the previous discussions of vegetation of the vine and *coulure*, it is apparent that excessive vegetation, induced by a warm Spring and the warmth during the day of the sand and gravel in light loose soils, and poverty of sap, caused by excessive moisture, which the limited sunlight and heat could not sufficiently elaborate and evaporate, were the causes of *coulure* in Southern California; and that the exceptions prove the rule because they were found where the soil was richer, the growth more normal and retarded. The influence of moisture or cold directly upon the fruiting organs, appeared to be wanting in results, for the failures and successes were recorded under the same climatic conditions. The influence of soil alone does not explain the disease, because it is found that second crops on the laterals set well on all soils where the vine is vigorous.

One conclusion is inevitable, viz.: That under ordinary conditions of culture, the *Moscatel* should be planted only in warm, well drained, fertile soils, which have a compact formation and sufficient clay and loam to prevent great porosity, provided there be not some good reason for desiring the crop to come on the lateral second growths.

It appears also to have been well proved that retarded growths and vines, having a sufficiency of buds to carry off the heavy flow of sap without excessive vegetation, provided the soil is reasonably rich in fertilizing matter, are, more or less, guarded against *coulure*.

The instance of vines, setting fruit well on rich alluvion, where the vegetation appeared to have been very rank, tends to show that fertilizing, such as I have suggested, might so enrich the early flow of sap as to prevent that poverty which is the chief cause of *coulure*.

The light sandy soils may also have an effect in partially arresting the elaboration of sap during excessive growths in cool damp weather; because such formations have a chilling influence at night, while clay soils retain and impart more warmth.

In other parts of the State I have found and hear of similar results with respect to the setting of the first and second crops.

It is apparent that by making proper efforts, the growth of laterals

and second crops might be easily provoked, but their maturity is always late, and their quality cannot be depended upon.

The *Moscatel* sends out shoots in an irregular manner. The second bud on the vertical spurs does not generally develop strong canes, nor often fine fruit. The lower bud generally makes the most vigorous cane, and is apt to throw it out horizontally, or so as to trail upon the ground. I am not yet quite certain whether the horizontal spurs do not develop the second bud as well as the first; a little further observation will settle that point.

The habit of the vine to throw its strongest growths horizontally causes the early development of the laterals and second crop, to prevent which, when desired, pinching may be practiced. To cause the vertical shoots to develop more strength and fruit, girdling might be resorted to. The finest fruit is usually found hanging to the horizontal branches, the most vigorous ones being on or near the ground. Girdling the vertical canes might have a tendency to equalize quality.

It being found desirable to keep the *Moscatel* pruned low with short spurs and the proper attention to selecting good fruit canes to cut on, the present system of planting and pruning is defective, because it rapidly elevates the head of the vine, and, as the vine acquires its full vigor, the contraction of the head to a low stump by reducing the branches, tends to force excessive vegetation and extraordinary lateral growths, and second crops. The present system of low and contracted heads with short spurs, is inconsistent with a normal development of vegetation in land where there is ample depth and moisture, and much space between the vines. If this system of pruning should be continued, the vines should be planted closer, except in very dry lands, when there is light rainfall and no irrigation; by doing so, the tendency to excessive vegetation, laterals, and second crops with *coulure* of the first would be reduced, and more systematic and intelligent management of the fruit spurs could be practiced.

That *Moscatel* vines show a tendency to become infertile as they grow older, may be for two reasons, viz.: When they are trained up in goblet shape the disposition of the vine to horizontal fertile growths is checked, and the vertical trunks show comparatively the same results that the vertical canes do while in vegetation; also, when great space is given in fertile soil, and the head is reduced to a mere stump at the level of the soil, the continuations of successive growths to indicate the true fruit wood are not carefully observed by pruners, who break down the naturally great fertility of the vine by frequently pruning on suckers, which, while they often bear good fruit, may not be able to preserve for a long time the fruiting principle in the vine. Suckers, also, are more inclined to rank growths, and may also promote *coulure*.

I have prepared Figures 1, 2, 3, 4, and 10, to illustrate methods of pruning, which I believe would be adapted to the present necessities of *Moscatel* growers, and which would not necessitate increasing the number of vines to the acre.

Figure 1 illustrates crudely the present low stumps on the level with the ground. The impracticability of rational pruning on such a plan must be apparent to any one who has studied the habits of the vine, or who will seriously consider the principles that I have discussed in Part IV. It may be urged that this plan is essentially the same as that practiced at Malaga; if so, it explains why the Malaga vines produce such small crops. It is not improbable that the Spanish people in

Malaga need instruction in their vineyards as they do elsewhere in agriculture. The principle of fertility in the vine is developed by culture; I believe that it may be destroyed by malpractice.

What I propose to suggest is a plan by which rational pruning can be conducted with short spurs, so that the vine may be given an equilibrium in branches and roots, and at the same time preserve their fruiting canes near or on the surface of the soil. Let the reader refer to the unilateral cordon (see Appendix II), and consider it extended on the surface of the soil, and pruned to short spurs, and he will have one ideal of a *Moscatel* pruned rationally, and preserving all the necessary requirements of its growth, its development being permitted in accordance with its strength, and all danger of excessive vegetation and second crop being avoided. Trained in that way no cross cultivation could be practiced, but there would be greater freedom for Summer work in the open space between the rows, and the extra hoeing would not be very expensive—it would not be counted if experiment should prove this system successful.

In Figure 2 a young vine is represented with two long canes fastened down to the level of the soil, one on each side, in the line of the row. The vegetation from the buds would be managed by pinching those too forward, so that all that were required might be developed. Figure 3 represents the same vine pruned the following Winter, with side arms and short spurs, produced by pruning on the development of the preceding season. The reader can see the principle, and extend it to suit his opinion of the extent of such arms the *Moscatel* could support. The pruning on the short spurs would slowly raise them, but, being easily comprehended and distinct, the arm when necessary may be reduced by first pruning a sucker to one bud the preceding year. The long canes, first laid down, might be made proportionate to the strength of the vine, and extended afterwards by laying down the cane of the terminal bud.

Figure 4 illustrates the proper method of pruning and treating the growth of one of the short spurs; d d show the points for pinching laterals; c shows the shoot from the second bud shortened for the benefit of the fruit; A and B show the points for pruning the following Winter, the cane yielding the new spur having been suffered to grow unchecked in length but with laterals pinched.

In pruning on extended arms or cordons, there is a tendency of the vine to develop its strength at the extremities. Whenever this is not sufficiently checked by careful and repeated pinching and Summer pruning of the extreme growths, the fruit arms may be occasionally reestablished by starting new arms from the base.

Figure 10 shows a modification of the *chaintre* system with side arms and short spurs, suitable for experimenting with *Moscatels*.

I do not think that it has been sufficiently established that in all cases long pruning, after the manner shown by Figures 5, 6, 7, 8, and 9, would not be suited to the *Moscatel*. There is much difference between overloading a vine with long wood and only supplying it with a requisite number of buds. Suppose that a vine may support ten short spurs of two buds each; that would be more exhausting than one long cane of eighteen buds and one short spur, or two canes of eight buds each and two short spurs. By systematically pinching the growths on the long canes there would be less waste of strength than where short spurs produce ten long shoots for the next year's

wood, instead of two or four by the Guyot system. Such systematic pinching as would be practiced on the long fruit arms would assist maturity.

I respectfully offer the foregoing suggestions for experimental pruning to those who are most interested. I was asked at the Fresno Convention how I would avoid the second crops and concentrate the strength of the vine on the first. These suggestions contain the necessary answer. If I did not adopt some new method, consistent with the vigor of the vine, I should plant closely in the line of the rows; in such places as Fresno probably three feet by nine, or even two feet by eight. I would then prune according to the strength of the vine, and trust to a little muscle for extra hoeing.

I am not of the opinion that it would be wise for those who have *Moscateles* in light soils, when they have failed from *coulure* this year, to abandon them, as some have proposed, without first applying some of the remedies that study of the vine would indicate. I have reflected on the question seriously and think that success is possible, as follows:

First Plan.—Prune the vines after your usual plan, excepting that you will leave four or five buds to each spur instead of two. The number of buds will retard vegetation, and two or three on each spur will always precede the rest; the upper ones will generally come first. Pinch three of the shoots (if five buds are left to the spur) as soon as they are six inches in length, leaving two, one of which shall be at the base, if well placed, for next year's spur. The shoots first developing will carry off the first flow of sap, and the leaves left in pinching will rapidly assist in developing sap and evaporating water; the enriched sap will flow back to fortify the retarded buds, which will be forced out by checking the development of the first. Later, and before blooming, pinch the one of the remaining two after determining which is best located for next year's wood. As soon as the fruit has set well, prune off the useless shoots which were first pinched, together with any fruit they may have on them, unless it is evident that the vine still needs them to carry off superfluous sap, and pinch all lateral growths. By this method I believe that Pasadena and other similar places might have had good first crops this year. Associate with this method fertilization as already recommended for the enrichment of the first flow of sap.

Second Plan.—While testing the first plan, prepare some vines to be reduced to the systems already suggested for low pruning, by training up suckers to form the new heads in case your vines are high. The second year prune the sucker to two buds, which will produce the two arms (Figure 2), or the long cane and short spur (Figures 5 and 7). If your vines are already low they may be prepared at once for any of these systems. When you prune make similar modifications as in first plan, leaving extra buds to treat as explained; also get a few vines ready to test on the *chaintre* system. It may not be necessary to use long stakes for training up the shoots of short spurs from *Moscateles*. Experience will solve the question.

The foregoing suggestions are hurriedly made, but, taken together with previous discussions of principles, may be easily understood. I sincerely hope that they may prove of some advantage, as the prospects of many of our new settlements will depend, in a measure, on the successful culture of the *Moscatele*.

MILDEW.—We are in danger of confounding the special disease, mildew, with general fungoid developments. This term is now properly applied only to the *peronospora viticola*, which is very common in States east of the Rocky Mountains, but which affects vines here only in damp or shady places. It may be looked for amid dense foliage in moist bottom lands, and especially when trees obscure the light and prevent free circulation of air; also, in the vicinity of sea fogs, or after Summer rains on rank foliage. It is a form of fungus that establishes growth on the under side of the leaf principally and penetrates into the tissues beyond the reach of sulphur fumes. It may be checked by prompt application of sulphur in the Spring and after occasional Summer rains, before the germs are well established; but in regions of fogs and dampness and in countries where Summer rains are frequent, practical remedies are difficult to invent. Powdered sulphate of iron has been found to be the most effective remedy in France for the Summer treatment, with a wash of the same material in a saturated solution in Winter. This is, no doubt, because this salt dissolves slowly and does not lose its virtue when wet, whereas sulphur is injured by rain.

The mildew attacks the *Vitis Californica* in France so severely that it kills its new growth during Summer and retards development. It is not probable that, when grafted, the grafts would be more liable to the disease. We have seen attacks upon nursery stocks this year on irrigated and low ground, caused by excessive and continued moisture, but we may congratulate ourselves that we are not seriously troubled with this disease in California.

The wild *Riparia* is free from its attacks, which may account for its wide range of growth, while the *Aestivalis* stocks, *Lenoir* particularly, is easily affected, which fact may also account for the restricted region in which it grows in Southern States.

There is more reason to believe that mildew has been the cause of failure to cultivate the *Vitis Vinifera*, or European stocks, in other parts of the United States, than the phylloxera. This is partially demonstrated by successes with the European vines under glass, the roots passing into the outer soils.

The word "mildew" should not be applied to the *oidium*, which is common in this State.

OIDIUM.—The general instructions for sulphuring vines, as a remedy for *oidium*, were published in my first annual report, pages 57 and 58. Observe the general rules, viz.:

Oidium and mildew are developed by favorable conditions of atmospheric moisture and warmth.

Sulphurous acid fumes from the combustion of sulphur under the heat of the sun, gently and gradually diffused about the vines, are practically beneficial.

The sulphur should be applied in *warm dry* weather in the form of powder; the triturated or ground sulphur is the best.

Do not apply when the leaves are wet.

Repeat applications, which have been rendered useless by rain, without delay, as soon as the weather is warm and dry.

First application when blooming commences; second, when the berries are well formed, before they are larger than peas; third, later, generally in July.

I think that, where *coulure* is feared, an application should also be

made as soon as the shoots are three or four inches long, to keep off the germs of disease. Probably the fungus that aids in producing *coulure* is the mildew and not *oidium*, which generally appears later.

Figures 18, 19, and 20 illustrate the appearances of the *oidium* on leaf, green canes, and fruit.

INSECT PESTS.—We have been troubled this year by various insect pests, among which are varieties of the army worm. Mr. Wheeler, our Secretary, will report on his experiments with insecticides. We have found that the remedies usually proposed were ineffectual when fairly tested. Worms treated with *buhach* have fallen down, but have recovered after awhile; others have eaten leaves treated with prescribed doses of Paris green, sickened, recovered, and finally become used to the diet. The doses popularly prescribed are generally ineffective. Mr. Drummond has injured foliage by using Paris green—one pound to fifty gallons; one pound to one hundred gallons proved ineffective in our experiments. Paris green should not be used on fruiting vines.

Mr. Matthew Cooke is studying these practical questions in the field, and will be prepared, no doubt, from time to time, to give more information, as experience proves the efficacy of remedies proposed.

Oil cake meal, especially that of mustard seed, is prescribed in France as a fertilizer, which has the power to destroy the larvæ of certain insects in the soil. I thought it might be useful to experiment with against the leaf hopper; but found on inquiry it could not be purchased for less than forty dollars per ton in San Francisco, because it was sold at a good price to manufacturers of ground mustard for table use! If it could only be used effectively against the humbugs of trade, it would be worth forty dollars a ton.

I am quite certain that for many forms of insects the turkey will prove to be the best friend of the vine-grower. All large vineyards could easily support flocks to keep among the vines until the vintage approaches, when they might be fattened on grain for the holiday markets. Sheep should also be turned in after the vintage to eat up all remaining vegetation, thereby destroying many eggs as well as tramping certain insects that hide in the surface soil. Early and thorough plowing, turning the surface well under, and hoeing the earth away from the trunks of the vines, will also prove advantageous. I see no good reason why hogs should not be turned in after the first plowing to root up and devour the chrysalids.

To destroy the leaf hoppers and moths in Summer I believe that the line of practical remedies will yet be found in perfecting a system of bright lights with traps to operate at night. Mr. Cooke has in view this method for experiment.

Toads and lizards should be protected. Quail, which show a disposition to haunt the vineyards, will do more good than harm, except where the number of vines is small. Birds, in fact, are not feared in vineyard districts as they are among orchards.

JAUNDICE AND RED LEAF.—Jaundice or chlorose of the vine is caused by damp and badly drained soil, which interferes with the healthful action of the rootlets. Excessive aridity and neglect to thoroughly cultivate the surface soil result in similar consequences, by depriving the surface rootlets from obtaining proper nourishment in moist warm soil near the surface. Careful and thorough pulveri-

zation of the surface with cultivator and clod-masher operates on the vine in effect as a fertilizing agency.

"Red leaf" I have found confounded with certain manifestations of oidium. There is a form of it which is distinct from fungoid disease, and it no doubt is caused by some defect of the root system or of the main trunk. That it sometimes affects only a single branch tends to prove this theory and also the intimate relation between certain roots and their corresponding branches. The root may be injured by plowing, by worms, or by gophers, the latter being the cause of frequent trouble and not sufficiently watched in many places. Bad pruning, especially the wretched and frequent sawing of branches, which is too common in some places, may also account for diseased conditions in the trunk at the base of the branches.

HAIL.—Hail caused great havoc early in the season this year near Pasadena; also at the Talcoa vineyard near Napa. Later, in August, it visited Riverside. Such troubles are rare in California, but are always feared in France. The practice in Europe is to cut back the injured growth, after the storm, so as to promote good growth for the next year's crop, if possible.

BLACK KNOT.—The spongy excrescences on vines, either on the fruit spurs, old wood, or roots, known here as black knot, are caused generally by early Fall or late Spring frosts, or by too close pruning. Sometimes it may possibly be traced to wounds caused while plowing or hoeing. Figure 17, in this volume, illustrates its general appearance. Early in its formation it is whitish and sappy; later it becomes hard and black. Wherever practicable, it should be cut out, removing so as to expose the sound wood, on which a coating of tar might be put with advantage. At what time this should be done I am uncertain, but I believe that the month of August would be better than the Spring-time, so as to prevent further trouble by the slow healing process, when the sap does not flow so vigorously; this, however, would often be difficult to accomplish; therefore I suggest the idea as a basis for experiment. Perhaps the early Winter might be a better time than the Spring.

On the fruit spurs it generally occurs at their base, when the buds have been injured by early Fall frosts.

On the main trunk of the roots, I believe, it is generally caused by imperfections in the original cuttings. I have taken up vines from nursery and found in certain seasons, after early Fall frosts of the preceding year, that certain varieties were more or less covered by the excrescences. In such cases the trouble may come from frozen spots in the cuttings, whether at the buds or between them. I have seen the same disease forming on green growing canes, caused by injuries to the tender bark from *oidium*, which produced splits. It is therefore probable that cuttings made from wood that has been severely attacked by *oidium* may cause black knot on the roots in vineyard thereafter.

These suggestions should serve as a caution to all planters to carefully inspect their cuttings, and to throw out as worthless all that they find defective. This may be done when the cuttings are being trimmed to a proper length. If possible, cuttings should be procured from vines which grow on warm soils, and which do not make excessive growth, but ripen canes of medium size early. Irrigated and

bottom land vineyards where the wood ripens late should generally be avoided as a source of cuttings; the hillsides are to be preferred for such purpose, whenever practicable.

The varieties that have been affected by black knot, as shown by my nursery, are *Moscatel*, *Burger*, *Zinfandel*, *Black Prince*, or *Rose of Peru*, and *West's White Prolific*. Some varieties may be severely frosted, yet show no such results. I believe the *Mission* is affected by it, but I have never raised any in nursery. The disease is not contagious, as some have feared.

Suckering too soon after early Fall frosts, before the fruit spurs have well developed, or before good suckers have taken their place in disposing of sap, will cause the disease to be aggravated. Early suckering after too close pruning, and irrigating at the time of Spring vegetation, would have a tendency to produce it.

DANGER FOR 1885.—The great number of insects, of the army worm character, that have appeared during the present year throughout the State, should cause a feeling of anxiety and caution for the safety of vegetation in 1885. That there may be a worse visitation next year is not improbable. Preparations to attack them as soon as they appear should be made. Possibly buhach powder or solution may be effective on the worms when very young; but it is not wise to rely upon that remedy alone. Sheep in the vineyard this year, after vintage; early thorough plowing; thorough cultivation and clod-mashing in Spring and the month of June, and washing the old wood of the vines after pruning with a strong solution of sulphate of iron, would be indicated as wise precautions, and not out of the line of ordinary good culture; sulphate of iron being a good protection against fungoid attacks, and a stimulant to vegetation. Sulphate of iron (copperas or green vitriol) is better and cheaper than sulphate of copper (bluestone or blue vitriol). It must be dissolved in wooden vessels, and may be applied with a brush or mop very economically; it should be used strong, five or six pounds to six or eight quarts of water. The effect of putting such a solution on the fruit buds is to retard their development; it has been used for such purpose to avoid frosts, but I would counsel a little caution in this respect until experiment has proved results. I have read of evil results, such as too late vegetation.

Mr. J. Schram, of Schramsburg, near St. Helena, has practiced the use of bluestone washing in Winter with an apparent advantage to his vines, which are free from fungus and insects.

PART VII.

MISCELLANEOUS TOPICS.

GRAFTING.—In Appendix III, already given to the public, many different methods of grafting the vine have been described and illustrated.

I have examined all the methods pursued in this State, and have made many practical experiments in my own vineyard and nursery. I am still in doubt as to some of the questions involved; the art is yet comparatively new.

I have known of but one successful attempt to bud vines in nursery in Spring time, after the manner of budding peaches and roses. I never tried it myself, having relied on reports that discouraged the attempt; yet there are growing at Inglenook, Capt. G. Niebaum's vineyard in Napa County, a lot of *Riparias* in nursery, budded last Spring by Mr. Mayers, the Superintendent, with *Mataro*, a large percentage having been successful. I shall watch the experiment with interest. They do not yet show the vigor of grafts made with the usual scions.

Dr. Conger, of Pasadena, has invented tools for sawing out a narrow perpendicular slot across the butt of an old vine, and for cutting the two sides of the scion, leaving shoulders. The scion is driven into the slot, one on each side of the vine, so as to unite the green cambium layers, under the barks; the insertion being not more than two thirds of an inch. The sides of the slot and scion are cut parallel; the work is what carpenters would call a mortised graft. Dr. Conger informed me in June that he had made quite a number of grafts in this way, and that all were growing. I saw one of them, which showed apparently a perfect union. If this method continues to prove successful, I should recommend it in preference to splitting the butts of old vines.

Of all the well known methods, including all those described in Appendix III, I have no hesitation in recommending the simple cleft, with wedge-shaped scion, practiced in the field, whether on old or young vines.

I am of the opinion that old vines with butts more than two inches in diameter should carry at least two grafts, on opposite sides, or else be grafted on one of the strong side roots. I believe that two main stems can be carried up, supported until strong, and pruned as well as two bunches may be started from the head above ground.

I referred to this under the general discussion of vine development, believing that it will be difficult, if not impossible, to put one scion so as to control and enter into relation with the entire root system of an old vine, cut off below ground and necessarily near the bifurcations of the roots. This is based on the theory that certain branches of the vine have direct relations with certain portions of the root system,

and that disturbing one will affect the other. Whether in course of time these relations may be forced to change, and different sap canals may be made tributary across an old stump to a new stem produced on one side of the butt, is a question I will not now undertake to decide, but that there is a tendency for the side not utilized at first to perish and rot away, I have proved by at least one experiment. I find to-day (while working on this topic at home) that the entire stump and root system of an old *Mission* vine, which I grafted in the Spring of 1883, has rotted away on the side not grafted. Two grafts had been put in on one side about two inches apart. Both grew very vigorously last year, and made canes from ten to twenty feet long. Last Winter I examined the butt, which was eight inches under the surface, and found everything apparently sound. One of the grafts was cut away, hoping then to make the other stronger. The growth this year has been very much weaker than the last. To-day I have bared the old stump and found that all excepting the section occupied by the two original grafts has rotted away, severing the trunk vertically; the root at the base of the graft that was cut off last Winter is sound yet, but the rotting process is sloughing off the trunk between it and the growing graft, so that the vine now appears to vegetate only in connection with one portion of the roots. The explanation of these phenomena I believe to be, viz.: the grafts *may* be nourished by transmission of watery solutions from all parts of the trunk and the roots beneath, but it does not return to all those parts the share of organic matter, elaborated in the vegetative parts, necessary to keep them in proper condition. The abnormal first growth and the subsequent decay of the parts of the roots, accompanied by temporary depression of growth, are therefore accounted for.

The necessity of alternating long fruit canes on different branches of a vine to prevent unequal development of the root system, is a practice consistent with this theory. Whether it will ultimately be best to rely on one graft on old stumps, even though my experience should prove to be a general one, I leave for experiment to determine; at present, for my own work, I should use two grafts, one on each side, or if grafting *Moscateles* on old stocks to be trained low, I should even put in three or four, suppressing only those that appeared weakly.

I have always used clay to cover the union of grafts and the exposed cuts, according to the general experience in France. My success has been very gratifying; whatever failures I have had have resulted from using scions that have been imported and arrived late in the Spring, more or less injured. I cannot trace any defects to the use of clay, although there might be some reason to doubt its usefulness when grafting is practiced late in May, during a very heavy flow of sap. I refer to pure, tenacious clay, such as stablemen use to put in the hoofs of horses, or even useful for pottery, not to clay soils, which would not be serviceable.

No impervious mastic or grafting wax should be used in grafting vines. If the joint is covered at all, it should be with some substance that will absorb moisture and the redundant sap, bleeding from the roots, and at the same time not provoke fermentation and rotting. I shall experiment hereafter with clay slightly impregnated with creosote, or phenyle, to prevent fermentation, with slacked lime on the butts of old vines to neutralize acids. When the flow of sap is

rapid, I believe also it would be well to cut off the trunk at least one day before grafting.

When the butts of large vines are split, I believe that clay is a great protection while the process of healing is going on, preventing the soil from entering the wound and from promoting fermentation with the discharging sap. The clay should, however, not be put on very thick, or so as to confine a large, wet, and cold mass about the point of union; its purpose should be only to protect the union, permitting the free escape of sap, and cracking easily when dried. I examined, at Mr. Crabb's, recently, a butt of about two inches and a half diameter, that had a graft growing on one side; the other side had apparently not been split open; the split in the center had not healed across—I could sink the blade of my knife deeply into it. If the graft should in time cover the whole butt, it may have a hollow in the main trunk of the root; this is now the third year of its growth. A covering of clay might possibly have protected this split, and prevented from rotting, while being surrounded by the increasing butt of the graft.

There is something apparently defective in this method of splitting old butts; possibly better results might be obtained by splitting only from one side, so as not to cross the center; but unless the split is towards the heart, it will be more difficult to fit the scion so as to unite the cambium layers on both sides.

All these foregoing observations are suggestions for study rather than conclusions; they tend to establish a theory that it would be better on old vines to cut the cleft for the scion without splitting; how to do this best, we have yet to determine.

As to young vines, not exceeding two inches in diameter, there is no trouble in practicing the common cleft graft; the new trunk soon covers the whole butt, and commands the entire root system before any damage to it can happen. Experience shows this in the field. My observation convinces me that after the first year, a graft on a butt of not over two inches in diameter, makes even more rapid development and fruits better than when it is on a larger and older stock, part of the roots of which it does not seem to utilize or strengthen.

I am, at present, of the opinion that it is better to graft not more than four or five inches below the surface, mounding the earth about the scions to keep them from drying. I write now, of course, of stocks not resistant. If deeper grafting is practiced it should be not less than eight inches, in order to permit roots to strike from the scion above the union.

For grafting resistant stocks, the first consideration is to prevent any roots striking from the scion above the point of union. Carelessness in this respect will result in the gradual dependence of the graft upon its own roots; and the root of the resistant stock will cease to develop, even after perfectly united. The stock to be grafted should be cut off about three inches below the surface. Scions should have two buds, one near the union, and one above the level of the soil, the earth being mounded up to the upper bud to protect it from drying. In loose sandy or loam soils it is well to cover the entire scion at least an inch deep. To prevent the scion from making roots from the edge of the cut portions, at the point of union, the covering of pure clay is most efficacious. Those who have not used clay have generally been troubled by such roots, to cut which causes

much labor, and endangers the graft during the operation. The clay seems to prevent the roots from starting, by surrounding the union with a material that contains no nutriment. After the graft is perfected the danger of rooting disappears. I find, also, that if suckers from the resistant stocks are promptly removed as fast as they appear during the first year, they give no further trouble.

There are several good reasons for preferring grafting in the field after permitting the resistant vines to grow one or two years. I have grafted a good many rooted stocks in the workshop and then placed them in nursery, but have always had a greater percentage of losses than when I have done the work in the field after vegetation has commenced. The rapidity of the work in the workshop is more than counterbalanced by the cost of the vines that fail to unite. In the field, when the grafts fail, the roots generally send up suckers, thus saving them for regrafting; this is more apt to be the case if the roots are allowed to grow two years before grafting. Moreover, the roots, once well established, do not die easily, and may be regrafted in August with wood of the year, then ripe enough for the purpose, or it may be done the following Spring.

I demonstrated the practicability of grafting in August, with wood of the year, last season on eighteen plants. Nearly all made a little growth before the frosts; the rest remained dormant until Spring, when all started well. The only drawback to this system is the facility with which such grafts may be knocked out of place during the Winter and Spring cultivations. With care and intelligent supervision this accident may be avoided. My grafts made in August, 1883, have developed this year nearly as vigorously as those made during the Spring preceding; one of them is bearing fruit. The Fall frosts catch the tender growths from August grafts, but mounding the earth well up preserves the buds at the base.

Another reason for preferring to plant the resistant stocks in the vineyard and permitting them to grow at least one year undisturbed is based on a principle which I have learned from the partial influence of the scion upon the root stock. The scion controls the shape and form of the roots, and possibly may weaken to some extent their resistant qualities; by permitting the roots to develop themselves normally before grafting, we may feel more assured in mind of their future resistance.

I have rows, side by side, of European vines grafted on *Taylor* roots. The roots were taken from nursery in the Spring of 1882 and planted in the vineyard. I received in May some cuttings from France. My *Taylors* had then (the twenty-fifth of May) developed shoots six to ten inches in length; but, of course, had developed little new root system. I grafted two rows of these roots on the twenty-fifth and twenty-sixth of May with scions of five varieties of the imported wood. The grafts took well, but made no extraordinary growth. The next Spring (1883), I grafted other adjacent rows of *Taylors*, then one year in place, with other imported stocks. The difference in development between the grafts of the two different years has been remarkable, the latter grafting outstripping the first, even on the first year, and holding their advantage on this their second year, all of them bearing fruit, while most of those grafted the first year have no fruit.

At the end of the first year most resistant stocks in unirrigated vineyards are still slender, and need to have the union carefully tied,

if grafted. To tie them use *raphia*, long soft and strong but pliant material from some species of palm leaf, or rice straw. It is essential that the ligatures should rot off during the Summer to prevent choking. Soaked in a weak solution of bluestone, or copperas, they will preserve long enough in moist soils. See Appendix III for instructions as to tying. Clay enveloping the union half an inch thick is sufficient.

At two years old, most resistant stocks may be grafted without tying, if they have made a stock three quarters of an inch in diameter.

In grafting stocks rooted from cuttings try to accomplish the work in cutting off the main stem about two inches above an old joint, so that in splitting it the joint may arrest the splitting at that point when the wedge graft is inserted.

In grafting seedlings, cut off the root below the crown at a point where on one side there is a straight vertical surface deep enough for the scion; then cut the cleft with a thin-bladed sharp *knife*, so as to make a straight vertical cut crossing all irregular fibrous structure. Seedling roots cannot be split safely. An insertion of one inch and a half is generally sufficient. To prepare seedlings for planting, all lateral roots within three inches of the crown should be cut off, and the crown should be planted two or three inches below the surface, so that when the graft is made a straight main root may be found to work on. At the end of the first year, all roots developing within four inches of the surface should be cut away. At the end of the second year, the plants will be in fine condition to graft; will bear a little fruit the first year of grafting on some varieties, and a better crop on the fourth year from the original planting than the scions would have done on their own roots at the same age.

Professor Husmann has hastened the process of grafting by substituting the shears for the knife and avoiding the use of clay. Until I am assured that haste can safely be called to assist the vine-grower, I shall continue to advise planters to "make haste slowly" with this serious operation. I have never been able to get more than eighty grafts in one day made by one man, but the operation could be facilitated by using three men, one to dig away the earth *carefully*, followed by the grafter, who will do *all* the surgical operations, including the cutting off of the stock, and then followed by the man who will put on the clay and *carefully* put back the soil and mound it so as not to endanger the graft, which will break off very easily at the point of union, and placing a small marking stake (a mere whitewashed splinter) to mark the location of the scion. The man who precedes, when he gets ahead of his work, can busy himself, with the aid of man number three, in setting the permanent stakes for the grafts to be trained upon. If sufficient expert men can be obtained, two might work together on the grafting; one cutting off the trunk and making the vertical cut, or split; the other making and fitting the scion. I will not take the responsibility of advising any less costly work. By such coöperation about one hundred good grafts per day can be made for each man employed and part of the stakes will be set. Possibly, expertness may bring the number to even one hundred and fifty, where no tying is necessary. Those who desire to work faster must take their own chances.

Any ordinary intelligent workman to whom can be explained the theory of grafting, the necessity of close joints, the situation of the

cambium layer under the bark, where the union takes place, and the danger and expenses of carelessness, who can "whittle" a stick or sharpen a pencil well, and who can and will do as good work at four o'clock in the afternoon as he does at seven in the morning, may be trusted to graft after one half hour's instruction. No careless men should meddle with grafting; it will pay better to employ carpenters at their usual wages.

Grafting should be commenced when the buds begin to swell, and continued without haste, if necessary, until the last week in May, or from the first of April to the twenty-fourth of May. During this time there will generally be from thirty to thirty-five good working days. Work cannot be done when the ground is wet and sticky. So that your workmen will not hesitate to kneel down when necessary, provide them with leather leggings well oiled. If only one hundred to the man are grafted daily, each set of three men will graft ten acres in thirty days, if the vines are seven feet apart each way; if they are planted for chaintres, seven by fourteen feet, they will graft twenty acres. This is all that it is safe to depend upon for the Spring season; but, if more rapid work is done, the proprietor may congratulate himself when it is over. The grafter should be paid ordinary wages, with a bonus based on the number that grow; if seventy-five per cent grow, nothing extra, but for all over seventy-five up to ninety per cent, a reasonable bonus; for all over ninety per cent a greater percentage of profit. There is no good reason why any of the grafts should fail if well executed; yet some will fail unaccountably.

The essentials for good grafting are: good healthy stocks with sap flowing; care in selection of sound short jointed wood for scions, carefully preserved in moist but not wet sand in a cool dark place; careful selection of the point two to four inches below the surface for cutting off the stock, which should be cut without bruising the tissues; careful cutting of the cleft where the straight scion may find a straight side to unite on; careful preservation of the cuttings in buckets of water during grafting, carried along by the grafters; careful selection of the wood for the scion, so that no defective tissues or buds are used; careful cutting of the sides of the wedges, so that a knife blade is approximated in shape, the thicker parts being outwards at the points of union under the bark; cutting the wedge so that one side is cut across the pith and the other does not expose it, so as to make the sharp extremity firm and solid; careful cutting of the scion so as to preserve an even surface exposed, not whittled into uneven undulations; careful insertion so as not to break or crowd the thin extremity; careful observation to determine whether the cambium layer unites more or less evenly; snug, tight tying, if necessary; and careful administration of clay and replacement of earth around the scion. Then, with careful suckering and loosening of the earth during the first season, with a hand trowel and not with a hoe, and tying up the new growth to the stakes, the work will be satisfactorily accomplished. No stupid or unfaithful men should be suffered to graft vines.

Accidentally good results may follow rapid and careless work, but I shall never be responsible for the losses that may occur, by advising anything but the most careful work. Following the advice I have outlined, after one half hour's instruction and explanation of the theory of grafting, my foreman, who had never done such work

before, makes from ninety to ninety-five per cent to grow, when he is using good scions.

I think I can have a tool made on the plan of shears, with a thin movable blade and a concave holding side opposite, letting the blade fall in a slot, with which the process of making the cleft may be hastened, after the plan pursued by Professor Husmann, but I should be afraid to use ordinary shears until further experience has demonstrated that they are sufficiently safe for the purpose. At present I prefer a sharp knife, similar to a shoemaker's, providing the grafter with a whetstone to keep the tool constantly with a keen edge, and a tool-box with an upright handle. For large stocks a chisel is generally used, and a wedge to keep the split open while inserting the scion.

Where the resistant stocks have been raised from cuttings, and are good and straight, the man who digs away the earth may, if ordinarily intelligent, be trusted to cut off the stem.

Scions that are well set may take some time to start; sometimes the growth will not appear before August; generally they will make a fine growth before that time.

The proprietor is the one who should learn all the details and be able to instruct his men. Our office is always open to those who desire to receive practical instruction, which can be imparted in a few minutes, provided the inquirer will first study what is already in print.

I have usually assumed that the cost of grafting young stocks that require tying, including the scions at ordinary prices of cuttings, will be about twenty dollars per thousand; where tying is not necessary, all the work is made easier, and the work may be done carefully for from twelve to fifteen dollars per thousand.

When I am satisfied that it is safe to recommend more rapid work I shall do so with great pleasure.

After the third week in May, I have had some good results, even up to the second week in June; but the flow of sap is then so strong that I would not recommend the work to be done, except experimentally. I believe, from my experience this year, grafting during the first week in June, that it would have been better to cut off the stocks at least a day in advance. In August there is a check in the vegetation, which renders grafting again easy. It may also be done in October, but with what percentage of success I do not yet know. During the Winter before the sap rises it is not safe to graft, unless it may be on old vines deeply, where the cutting used as a scion may grow, even if the union fails.

I have heard of an instrument invented at Berkeley to assist in grafting, but have not seen it. There is a French tool for making the scions, but I have no practical model.

Grafting vines on resistant stocks has the advantage of increasing vigor and fertility, as well as protecting them against phylloxera. The European vines make more vigorous canes and trunks than some of the resistant stocks; but when the latter are grafted young they respond immediately to the greater power of the foliage of the scions, and develop in equal proportion. My *Petite-Syrah* grafts on *Taylors*, that were planted in 1882, have canes this year (1884) ten and twelve feet long. On their fourth year from the original planting, and after the second of grafting, I shall be able to prune them with long fruit canes, after the Guyot system.

STAKES.—The cost of staking a vineyard is an important item to consider. Redwood split stakes are the best obtainable along the coast. I believe, however, that pine, with the butts soaked in a solution of sulphate of iron mixed with pyroligneous acid, would do nearly if not quite as good service in the interior. I shall try later to give this subject more special attention in time to report for our December Convention. Meanwhile I will copy the following statement, made at my request by Mr. L. H. Wakefield of this city, who is both a practical vine-grower and a dealer in stakes for vineyard use:

Stakes for vineyards are made out of the butts of redwood trees, and are got out by lumbermen in Santa Cruz, Humboldt Bay, and on the line of the North Pacific Coast Railroad, for dealers in San Francisco, and sold on orders from vine-growers in different districts of the State. It is necessary to have them dry for shipment, and hauled to the point of shipment while the roads in the mountains are in good condition, else they cannot be delivered when wanted. It would be of great importance to vine-growers if they would engage their stakes in Spring or early Summer, and in that way the stakes could be got out, and seasoned, and ready to ship on orders (in a dry state) to the point of reshipment at San Francisco, the expense of reloading and landing wharfage in San Francisco to be avoided. The cost of landing in San Francisco and hauling is not less than ten dollars per car, and must be avoided. Split stakes are much more valuable than sawed stakes; will last much longer in the ground, are cheaper, and contain much more lumber than the sawed stakes.

The sizes mostly used are 2 in. x 2 in.—6 feet; $1\frac{1}{2}$ x $1\frac{1}{2}$ —4 feet; and also $2\frac{1}{2}$ x 3 in. made for pickets; but the increased size will add to the cost if shipped by the Central Pacific Railroad Company, or per boat, about \$3 50 per M. when the price of the car is from \$16 to \$18 from point of shipment to point of destination; and this is to be considered when considering the size to be ordered.

For 4 feet stakes many order 4 feet redwood bolts, which are cheaper somewhat to the vineyardist for many points, as they can be split out in Winter by the farm hands when other work is not pressing. A cord of bolts should make 1,300 to 1,400 4 feet stakes. Something is saved in the shipment. Sawed stakes are made at different redwood sawmills on Puget Sound out of the waste slabs; are not so durable, but being uniform in size give a fine appearance, which is a sacrifice of utility to looks.

Sawed stakes are sold to the trade, vineyardists, and vine-growers according to the amount of lumber they contain. The number of stakes in a thousand feet of lumber is as follows: 2 in. x 2 in., 6 feet, 500 stakes. $1\frac{1}{2}$ in. x $1\frac{1}{2}$ in., 6 feet, 653 stakes. $1\frac{1}{2}$ in. x $1\frac{1}{2}$ in., 4 feet, 1,333 stakes—at \$21 per M. feet of lumber, the average price at Napa, Vallejo, or on the Sacramento Valley or Livermore Railroad.

The proper methods of staking vines should receive greater attention throughout the State than is now common. The delinquencies in this respect are generally due to miscalculations of the cost of establishing and maintaining the vineyard. The most experienced men realize the importance of producing the largest possible crops from the most desirable varieties of vines, consistent with their strength and without sacrificing quality. If a given area of land, cultivated at comparatively small addition in annual expenses, can be made to largely increase in profits, the planter can better afford to employ expert labor and will diminish his anxieties and taxes, and may have land to spare for other uses. If by adding one hundred dollars per acre to the cost of preparations for rational pruning and training of the vines, the net profit can be doubled, the result is equal economically to doubling the area under cultivation. Thus it may be that an acre of vineyard worth now five hundred dollars may be practically made equal to two acres by the judicious expenditure of one hundred dollars. Such calculations apply especially to the cultivation of such varieties as the *Riesling*, *Malbeck*, *Cabernet-Sauvignon*, *Meunier*, *Chauché noir*, *Trousseau*, *Emperor*, *Sultana*, etc., which require long pruning and careful training according to some one of the methods that have been described. The most expensive arrangements for skillfully training such stocks would be in the case of unilateral

ordons and trellises with stout posts and wires, or wooden slats, and at least, with the exception of the chaintre, would be the Guyot system, modified, as explained already, so as to dispense with wires and slats. In different places the cost of material would vary, but in the bay counties, the cost of purchasing, hauling, sharpening, and setting good redwood six feet stakes would be generally about forty-five dollars per thousand vines; for stout stakes, with two slats and wires, would be about one hundred dollars. With the latter, the most perfect and satisfactory results might be obtained, with some increased cost in hoeing on account of cultivating only one way.

Those who desire to plant varieties requiring long pruning should not shrink from these calculations. If they lack ample funds, they could plant less acreage, knowing that with skillful treatment the varieties which they plant will yield good crops and bring higher prices than ordinary stocks. It is, however, of the greatest moment that the planter should hesitate to plant any varieties requiring long pruning unless he is satisfied that the superior value of the products will fully reward him for increased expenses. Wherever he is satisfied that a ton of *Cabernet-Sauvignons* or *Rieslings* will yield double the net profit that he can realize from a ton of *Zinfandels*, *Mataros*, or *Burgers*, he can better afford to plant half his land, with all necessary appliances, with the former varieties, than the whole of it with the latter, for the assurance of superior quality and greater demand will be his guaranty against over-competition and slow sales.

It is to the interest of the entire industry that all who have reason to believe they may attain high quality should at least devote a portion of their vineyards to the noblest stocks, aiming, if possible, to use those which will blend well with and add quality to the products of their other vines. Thus, for instance, a vineyard might be planted with one half *Zinfandel* and one half *Tannat* and *Malbeck*, for black varieties, and one fifth as much more of *Colombar*, or *Folle Blanche*, the *Tannat* and *Malbeck* being the only ones requiring expensive training, and all together promising to make a decided improvement on *Zinfandel* alone. Or he might choose to plant two fifths *Mataro*, one fifth *Petite Syrah*, one fifth *Cabernet-Sauvignon*, and one fifth of some suitable white variety, to ferment together with the others, such as *West's White Prolific*, *Roussannes*, etc.; the *Petite Syrah* and *Cabernet-Sauvignon* being the only ones needing the extra preparations, the quality of the wine promising to be of high type, suitable for aging and bottling.

Vine-growers should reflect upon these questions seriously. I am, myself, confident of great success with the chaintre system for long runed stocks, avoiding the greater part of the expense of staking; but I do not urge it on the public, preferring to wait until practical demonstrations have proved its true value.

The practice of placing short stout stakes to support those vines, which are to be trained in goblet style, such as *Zinfandel*, *Mataro*, *Arignan*, *Grenache*, *Burger*, etc., until their trunks are strong and the branches well started, should not be avoided. Well balanced vines, and the regularity of future crops, as well as perfection in cultivation, can seldom be obtained without such aid. Careful staking is material assistance in forming the heads of the vines, and results in good even crops on the fourth and fifth years. Where there is a prevailing Summer wind, sufficiently steady to bend over the rampant growths of the second and third years, stakes four feet long will

enable the planter to tie up the canes, from which his fruit arms are to be formed, and so to preserve the future symmetry of his pruning. Otherwise, in sheltered places, a short stake, twenty-four to thirty inches in length, firmly set, will satisfy all demands.

Except in cases where vines are planted about three feet apart, I do not think that the Médoc system of low stakes and a single slat will fulfill the requirements of long pruned varieties in our fertile soils. Vines planted seven feet apart will be more vigorous, and require longer fruit canes, to obtain which high stakes must be set to train up the growth from the short spurs, as described heretofore for modifications of the Guyot system. Short stakes may then be used to fasten down the long canes in the lines of the rows, which can be removed, together with the fruit branch, when pruning is done, so as to permit cross cultivation.

A LESSON FROM SOUTH AFRICA.—I have for years been persistent in the endeavor to inculcate, as a principle for the guidance of vine-growers in California, the self-evident truth, that, lacking experience ourselves, we must take our first lessons from the experience of those places where excellence of products has been proved by popularity in the markets of the world, and where local prosperity demonstrates the merits of methods adopted. Such lessons as could be drawn from practical experience, taking into consideration, as nearly as possible, all conditions of climate, soil, vegetation, labor, etc., I have undertaken to set forth from time to time, as the progress of study revealed them, making modifications of statement as often as I have found myself inclined to error. I have feared that our people might be misled by temporary commercial successes during the time when demand for their products is greater than supply, foreseeing that it will not be long before the merchants will force to the distilleries many wines, which they now purchase at prices little less than those paid for superior goods.

While we may learn something from the experience of intelligent wine producers of France and Germany, we may note the general commercial weakness of the products of Spain and Italy, relieved from the ban of bad quality only by the products of certain notable districts. Among the comparatively new wine countries is the Cape Colony, of South Africa, made famous for awhile by its Constantia wines. The progress of planting vines became popular there and a large area was covered; but it is evident that neither sufficient care was exercised in selecting suitable varieties of vines, nor in popularizing rational methods of vinification. To such an extent have the vine-growers of that country fallen into errors, that their wine commerce is paralyzed by the general inferiority of the wines produced, and the colonial Government feels forced to aid the people in overcoming their difficulties by summoning the aid of foreign experts. The popular demand has even named one gentleman, who has identified himself with enthusiasm in the work of assisting to create in California an influence in favor of better quality in our cellars, and it is possible that he may receive a call from the colony.

Meanwhile a special committee of the Colonial Assembly, after investigating the depression in the wine trade, has published a report, from which the following extracts are made, viz.:

1. Your committee have to report that they have carefully considered the correspondence on the subject of the improvement of the wine industry referred to them, and that they have taken evidence bearing on the subject.

2. The ill repute of Cape wine is unfortunately proverbial and only too universal, and the result is that not only is it at the present time well nigh impossible to find a market elsewhere for a staple commodity, which can be produced here in almost unlimited quantity, but the home consumption is seriously restricted by the indifferent quality of the chief part of the product of our vineyards.

3. For this state of stagnation and depression there is only one remedy—the improvement of the quality of the article produced. It is true that the high duties levied in Europe act with peculiar force against wines produced in our climate; but the mere reduction in these duties will not in itself open a market for them, except for the purpose of adulteration, unless we can supply an article which will satisfy the requirements of those whom we are anxious to secure as purchasers. Nor will much satisfaction be found in endeavoring to fix the blame for the present state of affairs, by accusing the wine-farmer of giving insufficient attention to his trade, or by blaming the merchant for the ruinous course which he has pursued of giving a uniform price, irrespective of quality, and so stamping out any laudable but unremunerative attempt at improvement among the growers.

4. The wine industry in the Cape will never be set on its legs by lamentations over its past glories, or by any self-deception as to the causes of its present decadence; but, like every other trade, it will follow the ordinary laws of supply and demand. If a good article is produced it will find a market, and the industry will be a source of untold wealth both to the colony and those who pursue it, while as long as the present course of looking to quantity and neglecting quality is followed, the viticultural interest may be expected to remain in a depressed and struggling condition.

5. Among the chief faults of Cape wine enumerated by the several witnesses are: the earthy taste, which, according to some of them, is largely due to the bad manures used in cultivation; the immature state in which the produce is forced into the market: the use of raw spirit of bad quality to fortify the wine, in order to check fermentation, and the want of character in the wine itself, which arises from the way in which the trade is conducted, and which renders it almost impossible to establish a market for any special class of our wine in Europe, owing to the difficulty of satisfying any continuous demand which might spring up for it.

6. Various reasons have been pointed out for this unsatisfactory state of things, some of which are clearly preventable, while others require careful investigation and many experiments before we can determine whether they can be amended and what are the fitting remedies.

7. Among the first we must class the want of care in the preparation of the wine itself. Nearly all the witnesses agree that at present most of the cellars and the utensils used in them are ill ventilated and dirty, and that insufficient attention is paid to the selection of grapes for pressing, or to the separation of unripe and damaged grapes from those actually fit for use; while very few farmers take the trouble to separate the stalks from the fruit before treading, as is the universal practice in the best wine producing countries of Europe; or of classifying the crop according to the quality of the wine aimed at.

8. The evidence would also seem to show that too little care is taken in the selection of the sites for vineyards, or to the cultivation of the most fitting kind of grape for the production of fine wines, and its adaptation to the special soil.

9. While care and attention would remove the faults above stated, there are other drawbacks to the prosperity of the industry which cannot, with justice, be laid at the door of the wine farmer.

10. Chief among these is the great heat of our climate at the season of vintage, which, while it forces the grape to early maturity, and tends to produce a fruit in the most essential constituents of a good must, at the same time operates most disadvantageously by preventing that gradual fermentation of the juice necessary for the development of the finer sorts of wine.

Possibly, by a change in the mode of treatment and cultivation of the vines, the ripening of the fruit might be somewhat retarded and the harvest thrown back to a cooler season, and by the construction of underground cellars for fermenting, the temperature might be kept lower and more equable, but it is clear that the excessive heat which prevails now, and it is to be feared always will prevail during the vintage, constitutes one of the chief drawbacks against which the wine-growers of the Cape will have to contend, and that it is to this climatic defect that many of the faults of his produce may justly be attributed.

11. Another fatal defect is to be found in the existence of any proper and comprehensive system for maturing Cape wine on a large scale, and for bringing it to market of a sufficient age and of an even quality. At present the efforts of traders and farmers alike seem to be directed to bringing the crop into consumption as soon as possible, and to creating doctored imitations of European wines. It is unfortunate that these concoctions are the only form, except the costly Constantia, in which Cape wine is known in Europe, and until an improvement takes place in this respect, it is hopeless to expect that a really remunerative market, except for purposes of mixing with and adulterating superior growths, will ever be found for our colonial produce.

12. So strongly was this recognized by the growers themselves, that a few years ago they established a joint stock association, for the purpose of introducing improvements in the manufacture of Cape wines and buying up and maturing the growths of better quality. Unfortunately,

owing to gross mismanagement, the undertaking failed and put an end to an experiment which promised to be of the greatest value to the colonial wine industry.

14. It is obvious that Government assistance can do very little in the direction of improving the general commercial aspect of the wine trade, which must be left to the tender mercies of the mercantile instincts of those interested in it, who may, perhaps, be trusted to discover some day that it will pay better as an employment for their capital to establish a market for a wholesome wine of age and character than to obtain a scanty and fitful demand for the immature and brandied decoctions which, at a time when the demand for Cape wines reached its highest point in Europe, succeeded in making the very name of Cape wine a by-word and a reproach. Or the patriotic efforts of the wine growers must be invoked, who, undeterred by their previous failure, may be disposed to risk their capital in a fresh attempt to improve the staple on which their living depends, and by so doing take the only step likely to secure a permanent amelioration of their prospects and condition.

15. The improvement in the cultivation of the vine and the manufacture of wine, and the experiments necessary to that end, are matters, however, within the scope of Government action, and by turning our attention in this direction we should only be following the example of the most eminent wine producing countries in Europe, who have found the establishment of scientific wine stations of much practical value.

16. It is, perhaps, scarcely reasonable to expect a wine farmer of moderate means, however sincerely anxious he may be to improve his produce, to strike out a new line by adopting experiments which may perhaps hazard his whole crop for the year, or to spend his time in close attention to the production of the varieties of the grapevine which may take years to bring to any practical issue. He has neither the time nor the money to spare for such operations. All these things, however, and many others of a like kind, are absolutely necessary if we are ever to ask for an improvement in wine making here, and if we hope to keep abreast of those countries in Europe, or of our own sister colonies in Australia, where capital and intelligence are devoted to this object. More particularly is it desirable at a time of great depression like the present, when the resources of the colony can scarcely keep pace with the demands upon them, that no stone should be left unturned to improve and develop a long-standing industry, which is well suited to our climate and which holds out a prospect of unlimited expansion, both in wine, brandy, and in other products of the grape, such as raisins, which only require care in preparation to become most valuable subsidiary articles of export.

17. Your committee would therefore recommend that the attention of the Government be directed to the introduction of an expert from some viticultural establishment in Europe, with the view of the creation hereafter in this colony of one or more proof stations, where experiments in the cultivation of the vine, and in the manufacture of wine on the most approved scientific methods, could be conducted, and from which information and instruction could be afforded to those in this branch of agriculture. Such an expert would also be of use in giving advice and guidance to those institutions which have made the subject of agricultural chemistry a part of their educational course, and the laboratory, which would form part of any station, would be at hand to render assistance in the analysis of soils, manures, and of must, of which assistance many farmers would be glad to avail themselves.

In conclusion, your committee feel confident that a wisely directed expenditure in this direction would be justified by the important bearing which any improvement in the wine industry must have on the welfare of the colony.

I feel confident that this Commission may offer to the vine-growers of Cape Colony a little advice, viz.: That they must first adapt their varieties of vines with reference to their climate, studying Algiers, Spain, Portugal, and the south of France for their models of excellence and the means of attaining them; secondly, they must popularize the general scientific principles which govern fermentation, as taught by the most advanced students and contained in the literature of France and Germany; and, thirdly, they must associate their varieties of vines as much as possible for fermentation together, avoiding the necessity of subsequent blending whenever practicable, each vineyard being as complete as circumstances may permit in itself.

If the vine-growers in any part of California fall into the unfortunate condition of those of Cape Colony, it will not be because the State and its Commission has failed to warn them in time, or to point out the true path.

If our people fail to appreciate their present opportunities to coöperate in acquiring information, or to profit by experience of others, they will find few to sympathize with them. Strife for quality, and rapid execution of all demonstrated means to success should be our watch-

words. To attain necessary information this Commission needs to feel the hand and heart and hear the voice of all who are interested in the common cause. Those who rely for success in marketing inferior goods upon the manipulations of merchants, will, in a very few years, find themselves in the condition of the Cape Colonists. We have a great deal to do and a great deal to undo, and what is to be undone must be performed with nerve, decision, and intelligence, free from all delusions of flattery and prejudice.

SAMPLES OF DISTILLATES, ETC.—We have recently received at the offices of the Commission samples of young brandies, distilled experimentally by Mr. L. J. Rose, Commissioner for the Los Angeles District, from wine of the *Burger*, *Blaue Elba*, *Zinfandel*, and *Mission*, each separately. So far as present indications show, the *Burger* distillate is the finest. These are most instructive studies.

In grafting, we have heard of most successful results at Mr. Flamant's, near Napa, on seedling *Californicas*, *Riparias*, *Elviras*, etc. Mr. Flamant owns part of the estate of the late J. W. Simonton, and is preparing a report for the Napa Viticultural Society, which will contain interesting details. He prefers the *Californica* as a grafting stock. Mr. E. W. Maslin has made equally good results in the Sierra foothills, concerning which his eloquent address before the El Dorado Agricultural Society this year contains information. Mr. Julius Dresel, of Sonoma, Mr. Charles Krug, Commissioner for the Napa District, Mr. R. T. Pierce, of Santa Clara, Mr. George Husmann, of Taloa Vineyard, Napa, and others, can give further evidence on this topic.

CONCLUSION.—In concluding this volume, I feel pressed to do so for want of time, notwithstanding there are many other topics requiring discussion. I have tried to treat of the most important matters interesting to the vine-grower, so as to clear the way for future studies of fermentation. I trust that my work may bring to me from those interested many new suggestions, so that in course of time any hastily formed opinions may be modified or corrected, as actual experience or sound theory may require. Working as I do under pressure, I hope that literary defects may be treated with kind indulgence, as they are noted; that there are many, I am very conscious.

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SECOND ANNUAL REPORT
OF THE
CHIEF EXECUTIVE VITICULTURAL OFFICER
TO THE
BOARD OF STATE VITICULTURAL COMMISSIONERS,
FOR THE YEAR 1882-3.

OFFICE: 111 Leidesdorff Street, San Francisco, Cal.

APPENDIX I. The Chaintre System of Pruning and Conducting the Vine.



SACRAMENTO:
STATE OFFICE.....JAMES J. AYERS, SUPT. STATE PRINTING.
1883.

PREFACE.

I shall not presume to discuss at this time the merits of the Chain-tre system of pruning and cultivating the vine. The translations, which I have considered important to publish for the study and use of our vine-growers, and which are contained in this Appendix, fully explain all that is necessary to be known by any one who desires to experiment with or to adopt the system. I have been so far convinced of its superiority that I have already planted my young vineyard after this manner, and intend to continue my plantations in this way whenever it is practicable to do so. Several others have followed my example in the Livermore Valley; nearly four hundred acres in the aggregate being now devoted to the new system. In a few years we shall have actual experience in this State to demonstrate whether our choice of methods is wise or not. Meanwhile I take pleasure in commending the subject to the serious attention of all who are interested in viticulture, and especially to those—

1st. Who desire to replant vineyards which have been attacked by phylloxera;

2d. Who intend to use phylloxera-resistant stocks to be grafted upon with noble vines;

3d. Who desire to cultivate noble vines which will not produce profitable crops with ordinary methods of pruning.

4th. Who desire to produce fine qualities and good crops in raisin-making.

That this system will not be practicable for all conditions of soil, climate, and exposure, and all varieties of vines, is clearly explained in the translations given; but that it is especially suited to nearly all situations in this State, where Summer irrigation is not practiced, and where erect growing vines, requiring short pruning, are not cultivated, is an opinion that I do not hesitate to advance.

Those of us, who are aiming to ennoble the viticultural products of our country by the cultivation of the noblest vines, have found that such vines are shy bearers, and require long pruning. To obtain a sufficiently profitable crop, we find ourselves plunged into great expenses by reason of the excessive cost of training vines, etc. I am

of the opinion that with the Chaintre system the noblest vines will produce as well as our ordinary varieties do with our ordinary methods of pruning, and that the cost of culture per acre will not exceed that of vineyards of *Rieslings* now trained to high stakes, while there will be the saving of the stakes, etc.

When resistant vines are to be grafted, the manifest economy in the first cost of planting and grafting is self-evident, generally not one half the number of plants being placed to the acre.

All the authorities quoted in these translations are esteemed the highest in France, and their names are celebrated in their profession. Other systems of pruning and cultivating will be explained in other translations, which will appear as Appendices to this report; but I have thought it most important to issue this one without delay. It is to my sister, Miss Annie Louise Wetmore, that I am again indebted for valuable assistance in the irksome part of translation.

CHAS. A. WETMORE,
Chief Executive Viticultural Officer.

SAN FRANCISCO, September 5, 1883.

CULTURE OF THE VINE EN CHAINTRES,

BY A. VIAS, INSTITUTEUR AT CHISSAY (LOIR-ET-CHER).

FOURTH EDITION.

(This work has been honored by subscriptions of the Ministers of Agriculture and of Public Instruction.)

MISS ANNA LOUISE WETMORE, TRANSLATOR.

INTRODUCTION.

The favor with which the different editions of this book were received by the viticultural public, necessitates our reviewing, and to some extent, modifying the work, especially concerning the direction to be given the chaintres, and the manner of cultivating them.

At the present time, chaintres are known nearly everywhere where the vine is cultivated, and what helps to render this new method popular, besides the splendid results and the notable reduction in manual labor, is, that it will apparently become a powerful auxiliary against the inroads of phylloxera.

The chaintre method rests on fundamental principles, which the inventor may have been ignorant of, but which he guessed at and knew how to apply. These principles are:

1. The vigor, longevity, and fertility of the vine increase in direct proportion to the development of its arborescence.

2. The quality of the fruit decreases sensibly in proportion to its elevation above the level of the ground.

3. The revenue of the vine-grower increases in direct proportion to the economy realized in hand labor, in fertilizing, and in accessory expenses.

It is by virtue of these principles, that chaintre culture is now extolled in view of arresting the terrible plague which seems to mock the efforts made by science to put an end to its devastations. We therefore believe it necessary to add to this new edition a chapter on that important side of the question.

Moreover, the great movement towards chaintres becomes still more important, according as this new method of culture will permit of reconstituting, at little cost, the destroyed vineyards, and of replacing the old by the new vineyard, almost without interruption in the vintage.

"The commune of Chissay," says M. A. Schmid, "will become legendary in the history of French viticulture. In its territory the most curious method of fructification that has hitherto been applied to the vine, was discovered by one of its most modest but also most able vine-growers."

It was Denis Lusseaudeau, of Etienne, who directed this commune into the prosperous road where we now find it. This benefactor is no more; he died December 24, 1880. A short time before we induced him to give us his portrait, and we thought it would be well to reproduce it at the beginning of this work. We let slip no opportunity of saluting, in the name of the viticultural public, the memory of the valiant and able vine-grower whom we sympathetically call Father Denis. Born a simple laboring man, he worked his way up by his toil and intelligence in the method of cultivating the vine *en chaintres*, to the fortune and honor—rare among humble workingmen—of the decoration of the Legion of Honor.

Honor to him who was able to put the culture of the vine within the reach of the whole world, and to obtain the maximum of production by the simplest and most inexpensive method ; who did not allow himself to be disheartened by the jeers and sarcasms with which he was long assailed. Like that philosopher of antiquity before whom they used to deny there was any progress, he marches on, and the problem is solved. Honor to him; he has deserved well of his country and of viticulture.

After much criticism our vine-growers first imitated, then perfected in a remarkable way, the system of *chaintres*. Finally, in 1875, the Minister of Agriculture awarded to the Commune of Chissay a special gold medal for the excellence of its viticultural methods.

As for the author of this work, for twenty-five years a witness of the prodigies effected by the vine-growers of Chissay, he would not have had the temerity to undertake it, if he had not received the encouragement and friendly support of Count de Baillon, Mayor of Chissay. May he be permitted here to express his lively gratitude to him. He has thus become a viticulturist himself through self devotion, and in order to popularize, for the benefit of France, the most economical and productive system of viticulture.

The eminent and lamented Doctor Guyot has recognized the worth of this method in his studies on the vineyards of France, and wished to congratulate us highly on the manner in which we had treated the subject, and for having put before the eyes of the vine-growing world *an important model of viticulture*.

A. VIAS.

CHISSAY, March, 1882.

CULTURE OF THE VINE EN CHAINTRES.

HISTORY AND DEFINITION.

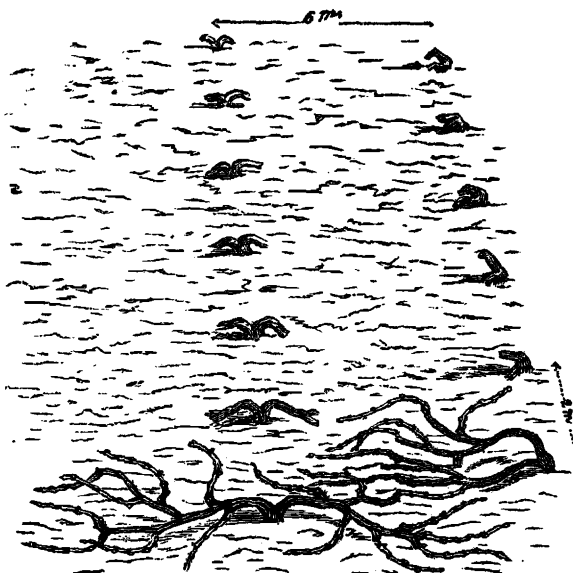
Fifty years ago there was introduced in the Commune of Chissay (1) a new method of culture of the vine called *culture par chaintres* (2), which consisted in planting rows of vines about twenty feet apart (Fig. 1), and in cultivating them with the plow.

This new method of treating the vine sensibly reduced the expense of culture, while doubling the production.

The ever increasing elevation in the price of hand labor has been the chief cause of this change of culture, invented and first applied in this commune.

Count de Gourcy, in his valuable agricultural travels, thus relates the origin of this invention:

FIG. 1.



Vineyard planted *en chaintres*, the rows about twenty feet apart, and the vines about six and one half feet from each other in the rows.

Denis Lusseaudeau, having inherited from his father lands then valued at a thousand crowns (3,000 francs), conceived that the best thing for him to do was to transform them into vineyards, but not at the rate of 9,000 vines to the hectare (about two and one half acres), and not to cultivate them by hand, as is the custom of the country, but at the rate of 400 vines, and to cultivate about three fourths with the plow, at the same time earning a living by harvesting wheat and fodder in the spaces between the vines. Master Denis accordingly then rented a plow and horses, and marked a furrow two metres from the edge of one of his fields, while his wife followed him armed with a pole two metres (about six feet eight inches) long, and put a cutting at each length of the pole in the furrow; then the husband made a second furrow serving to close up the first. They recommenced the same operation twelve metres

(about forty feet) from the first furrow, and so on to the end of their field.

Mr. Denis then cultivated the space between the rows, as in ordinary fields, without going too close to the vines. By the third year he left a metre on each side of the rows of vines to be cultivated hereafter by hand; by the fifth year, when the vines were vigorous and amply provided with canes, instead of confining them in the two metres devoted to their special culture, he thought of spreading them, in the months of June and July, in the space destined for

(1) Chissay, on the banks of the Cher and on the road from Tours to Vierzon; 1,200 inhabitants. Vine-growing is here the predominant occupation; it is carried on by eight tenths of the inhabitants. The wine obtained here is one of the best productions of the valley of the Cher.

(2) At first written *chintres* (corruption of *centre*). Plowmen in some countries call *chintre* the semicircle that they make at the end of a furrow in turning to start a new one.

We prefer the spelling of Dr. Jules Guyot, which translates *chaintres* as trailing chains; in fact, it is more in accordance with the idea we are able to form of this method. It is also the way Littré, the learned academician, writes it.

the cultivation of wheat, in one part, and of artificial meadows in the other. By making use of this last space mown, harvested, and plowed by St. John's Day, at the latest, the vines and their canes, supported by little forks, could be extended until vintage time. The vintage over, he arranged the branches and their canes within the limits of the two metres allowed for their special culture, and then sowed his wheat and his meadow.

Nearly all the vineyards of Chissay and the environs are planted and conducted, according to Mr. Denis Lusseau's method. Vineyards thus planted yield, after five years, at least as much wine as those having one vine to the square metre, and yield, besides, about $7\frac{1}{2}$ roods of grain and an equal amount of fodder to the hectare (about $2\frac{1}{2}$ acres), leaving only about $2\frac{1}{2}$ roods to be cultivated by hand. Moreover, Mr. Denis, who had in all only from 5,000 to 6,000 francs inheritance, now possesses more than 100,000 francs. He obtained from one hectare (about $2\frac{1}{2}$ acres), planted in this way, more than 40 barrels of wine of 55 gallons each, sold at 80 francs, say 3,200 francs obtained from about $2\frac{1}{2}$ roods of vines; and from the other $7\frac{1}{2}$ roods, 22 bushels of grain, at 20 francs, and 300 bundles of fodder at 30 francs, say 250 francs from intercalary culture—in all 3,450 francs per hectare.

It was thus, without doubt, a good, an excellent idea, which honors him who made it known, as well as the country which hastened to receive it. We insist that it was not accident that made the discovery of this method of culture. We know that at all times traducers and the envious have essayed to lay obstacles in the path of merit. Whatever may have been the motive that guided our compatriot in his endeavors, it is no less true that the example given by him bears its fruit, and that notwithstanding the important ameliorations due to the vine-growers of Chissay, we owe everlasting gratitude to him who was the first cause of that extraordinary production of the vine in our country, although he did not foresee at the outset all the results of the culture which he adopted. It is, therefore, a new road opened to viticulture, an admirable invention at first unappreciated, but which, owing to its results, is now estimated at its true value. It renders the cultivation of the vine accessible to all, whereas, by the other methods, it is the monopoly of well-to-do vine-growers, and which, if applied to one or two hectares every farm or metairie in certain countries near enough to us, would allow each petty farmer, without taking scarcely anything from the other culture, to serve wine at every meal throughout the year, instead of buying a barrel of it at a high price for the harvest time.

Doctor Guyot thus expresses himself on the subject of this method of culture, in a letter inserted November 20, 1865, in the *Journal d'Agriculture Pratique*:

* * * * Moreover, we have many other viticultural prodigies, without counting the Cazenave and Marcon system. I have been brought face to face with a method of culture invented by a peasant vine-grower known by the name of Father Denis, living at Beaune, commune of Chissay, near Montrichard (Loir-et-Cher). This method of cultivating the vine is called the *chaintres* system, which I translate, *trailing chains*. Never have I seen anything more wonderful in its crude simplicity. Figure to yourself each vine consisting of from three to five arms from thirteen to twenty feet long, almost trailing on the ground, and each arm bearing three or four fruit-bearing canes, each being from five to seven and even ten feet long. These fruit-bearing canes are allowed to grow to almost their full length. Imagine to yourself each of these interminable canes adorned with magnificent bunches of grapes, from one end to the other, without interruption and without variation in the perfection of maturity. These canes are raised above the ground by means of little forked stakes not quite one foot high, to prevent the grapes from rotting. Add to this, immense canes for next year's pruning, running between these garlands of fruit, and you will be as astonished as myself. But when you learn, as I have learned, that after the fall of the leaves, or before pruning, all of these long arms are taken up and turned back on the neighboring *chaintre*, to give the plow every chance to work without hindrance, and then put back into their places after the plowing is over, you will admire the lofty intelligence which saw, notwithstanding the opposing traditional customs, that the vine should grow at liberty and acquire strength and size in order to yield good fruit; that it should always lie low on the ground to perfect the maturity of the grapes (the wines of Chissay are the most highly estimated of those of the Cher; they are produced by the variety called *côtes*); and that these two conditions, owing to the elasticity of the canes, could be reconciled with the necessity of a perfect culture, rapid and economical. You will

also admire this good Father Denis, who saw that with long fruit-bearing canes he would escape in great measure the effects of Spring frosts. I would be very much surprised if my dear and learned brother, Dr. Pigeaux, who has traveled through India and Persia, to bring from there seeds, trees, and also vines, does not go to visit the vineyards of Chissay, as the finest specimens, and as the best demonstration that he has ever met with of his theories, perhaps slightly exaggerated, but certainly well founded, on the pruning or rather the non-pruning of fruit trees.

We have seen by the preceding, that the spaces between the rows of vines were cultivated as other lands, with the sole difference that they could not be plowed crosswise, nor be used for pasturing animals. The sowing is done as though there had been no vines there, but the spaces between the vines in the row were worked by hand, until the fourth year, when an extent of about eight and a third feet was assigned to hand labor.

As soon as the vines began to bear, care was taken, after the harvest, to plow and harrow the stubble field, and then to extend the canes lying along the rows of vines in the opposite direction; that is to say, perpendicularly to the vine row, and over the ground that had just been plowed. The canes were supported by little stakes about a foot long, pointed at one end and notched at the other. This kept them up high enough to prevent the bunches of grapes being injured, and low enough to assure the maturity of the fruit and the superior quality of the vine. The earth then acts the part of a wall. "It is owing to the fact that the vine *en chaintres*," says Mr. Guyot, "has the earth for an immediate reflector, that it surpasses vines trained on trellises in the quality of its wines."

Such was, originally, the manner of working. Since then, great improvement has been made, and the inventor himself, as well as his imitators, was obliged to march resolutely in the path of progress. It is especially in the last ten years that the most praiseworthy efforts have been made to perfect this method. Many vine-growers are not content simply to adopt this method of culture for new plantations, but resolve to do away with three rows out of every five in their vineyards planted according to the old method, thus separating the rows that are reserved by a space of about thirteen feet. See how highly Father Denis' invention is estimated! Is it any wonder that we depart from the regular routine when we come to compare the results obtained from the two systems in use in our country?

We shall now examine successively, in the following chapters, all the different operations embraced in this method of culture at the present day.

CHAPTER I.

PLANTATION.

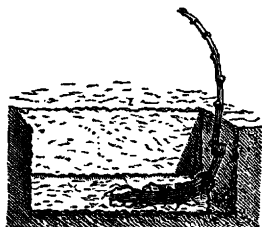
The vineyard is planted with cuttings set out in the open field, with or without old wood; but the preference is given rooted vines, grown for two or three years in the nursery, which are planted at a depth of about eleven inches. In light soil a greater depth may be allowed. Planting is done in mild weather, and when the soil is not too moist.

We have said that the deeper cuttings are planted the more retarded will be the first vintage; the proper depth, according to the best cal-

culations, seems to be about eight inches. "Experience seems to prove," says Mr. Guyot, "that cuttings planted about eight inches deep, the earth being well packed around them, a single eye left above ground, and that eye being covered over with sand, may yield fruit as early as the second year, but certainly by the third."

That is true for vines planted in the ordinary way, but for vines *en chaintres* one cannot expect a vintage before the fourth year, since the main stem must first be formed, which is not accomplished with us until the third year after planting.

FIG. 2.



Method of planting the vine in Chissey.

Cuttings, as well as rooted vines, are usually planted, quincunx fashion, down to the level of the soil; cuttings being planted with the simple pick; rooted vines placed in a hole twenty inches wide and twenty-five inches long. (See Fig. 2.)

However, one method of planting the *chaintre*, which is frequently adopted and is very expeditious, is to set the cuttings or the rooted vines in the furrow made by the plow, after having made a hole for each plant with the pick. The expense of planting is diminished correspondingly.

The cuttings or rooted vines are bent to form an elbow in the ground, and raised vertically, that is to say, that part of the cane above ground must form an angle with the part under ground, then the whole is filled up with the earth that was taken out, and sometimes with the addition of fertilizing matter. When the vines are planted in furrows made by the plow, which is seldom done in Chissey, the elbow is made by the weight of the earth on the cane.

It has often been asked whether planting in trenches has any chance of success. This method may, in reality, yield the best results and insure the rooting of the young plant, while favoring its development to an astonishing degree.

The earth is not beaten down with force, but is simply pressed around the vines. Some leave two eyes above ground, others only one. Cuttings taken from the lower part of the canes, we are told, are of slower development than those taken higher up.

Cuttings well chosen, well prepared, and properly planted, according to the ablest viticulturists, develop sooner and yield more fruit the second and third year than rooted vines. The only inconvenience arising in the use of cuttings is that we are never certain that all will take root, and that it is difficult for the late vines to catch up with those in advance of them.

Our vine-growers are not at all convinced of this truth that has been proved by viticultural experiments, and always prefer to set out rooted vines. We might say that in dry soil, we would use rooted vines, and reserve cuttings for moist land, in which it is advisable to plant in small trenches a little over three feet wide and about a foot and a half deep, at the bottom of which is first put heather or furze. This method has the advantage of fertilizing and draining at the same time.

If it is desired to plant in more or less deep ditches, two rows of vines must not be put in the same ditch, but one only; otherwise the roots would very soon become entangled with each other. The

trenches will therefore be dug about sixteen, twenty, or twenty-four feet apart.

Planting is usually done in Winter, without waiting for Spring; it would be well, however, especially in cold and moist soil, to plant only in the months of February or March, when the severe cold weather is over and the buds are no longer exposed to frosts or injured by late rains.

Planted under good conditions, our vines begin to bear in four years; they are in full bearing by the eighth year.

We have seen that the variety used in this sort of culture is the variety of Cahors called *côt* in this country. Let us hasten to say that it is the green-stemmed variety that is most extensively used, that with the red stem being considered as unproductive. We call *côt rouge*, a degenerated species in which the wood and leaf are redder than in the ordinary *côt*, but in which the fruit decays before maturity.

There is also the *côt* with red stem, which is the *côt* of Bordeaux; it yields abundantly, but ripens imperfectly in our country. But the *côt* is not the only variety suitable for culture *en chainâtres*; all varieties requiring long pruning, such as the pineaus, jurançon, sauvignon, picpoule, périgord, folle noire, carmelin, merlot, grolot, cabernet, carmenère du Médoc, sirrha de l'Hermitage, mondeuse de Savoie, petit bouchet, plussart du Jura, fouella de Nice, théoulié de Draguignan, pecoui-touar, which Count Odart calls calitor; aramon (1), also called plant riche; mataro or mourvède, and even the barbera d'Italie, may also be selected, according to the locality, to be trained in the Chissay method. It would not be the same with the gros gamais, liverduns, teret-bouret, grenaches, and carignans, which would not thrive under that treatment.

As for the nature and quality of the wines obtained, they are red wines, very rich in color, containing tannin, and very much sought after in commerce among the so called wines of the Cher (2).

The *côt*, we have said, gives the best wine that is obtained from these vineyards, and in addition to that advantage, requires very long pruning; moreover, trained *en chainâtres*, it is never attacked by *oïdium*; on trellises, on the contrary, it may suffer from it like other varieties; that explains why it is chosen in preference to any other. Then, too, the intelligent viticulturist to whom we are indebted for this new method of vine-training, left his canes three or four years before cutting them from the vines, during which time they grew to a length of from thirteen to sixteen feet. These vines were then eight or ten years old. (Fig. 3.) This practice has long been completely abandoned.

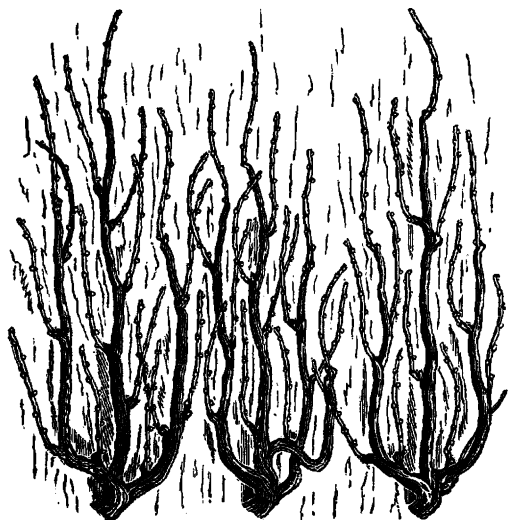
It has been asked what is the direction given to the vine rows in our method of culture. Chissay being a hilly country is planted

(1) The aramon, which is of vigorous vegetation, is not a variety requiring long pruning, according to Mr. Jules Guyot's opinion, who says it is a detestable variety. Is that because humidity prevents its setting well? The Doctor says nothing about that. Count Joseph de Rovasenda, of Turin, author of *Saggio di ampelografia*, is of a contrary opinion. He has experimented with the different known varieties, and thinks that the aramon could be trained *en chainâtres*, but in a very rich soil. Mr. Armand Cazonave, author of a highly esteemed method of viticulture, considers that pruning *en chainâtres* would be suitable for it only on condition of leaving spurs in place of long canes all along the vine. This very fertile variety ripens imperfectly in our climate. It would thrive very well in the southern part of France and in Algeria.

(2) The most renowned vineyards on the banks of the Cher are in the Department of Loir-et-Cher: Thésée, Monthou-sur-Cher, Chissay, and Saint-Georges-sur-Cher; they are almost exclusively planted with the *côt*, and produce wines remarkable for their body, color, good taste, and alcoholic quality; they belong to the category of wines designated in commerce under the generic name of Cher wines—wines having a certain pungency that makes them sought after to give character to weak wines, and to restore those that are too old. They are good ordinary wines.—[Victor Rendu, *Ampélographie Française*.]

according to the inclination, in order to facilitate plowing; therefore we have the arms of the vines sheltered from, as well as exposed to, the wind; but if it is possible to choose the direction, we will state,

FIG. 3.



Three *chaintres* planted about six and a half feet apart.

that the most suitable one for the vine, in Chissay, is north and south, because then the rows not shading each other have an eastern and western protection, and the soil is more easily heated, struck by the sun's rays in the middle of the day. "I mention here," says Mr. Jules Guyot, in speaking of the method *en chaintres*, "that the heads of the vines are directed to the north or the northeast, in order to avoid the injurious effects of the southwest wind."

In countries where they have high winds, as on the borders of the Mediterranean, it would be well

to have but a single arm, and train all the *chaintres* in the same direction.

But we are not always at liberty to choose the desirable direction. The land might be unfavorable to such a choice, and require a different direction from that we give here. It is well in every case to come as near to it as possible, exposing the vines from the north to the east and west, and not from the east to the south.

CHAPTER II.

SPACING.

Precise rules for the proper spaces between the rows, and between the vines in the rows, cannot be given. That depends largely on the size of the piece of land to be planted. We often come across fields that are not large enough for three rows of vines. In those of more considerable extent, and especially where it is a matter of planting a vineyard of several hectares in extent, the rows are at an equal distance from each other—that is, about twenty feet—and the vines in the rows are from about six and one half to ten feet apart. (Fig. 1.) The space now recommended is about sixteen and one half feet. Thirteen feet would not be sufficient, and would render it difficult to turn round with a cart, either in hauling fertilizers or when cutting off the canes and gathering the grapes.

The farther apart the vines are planted the less manual labor is required in cultivating, which is more expensive than cultivation with the plow.

The branches are more flexible when they are longer.

The distance of twenty feet seems too large, especially if the land is not very rich. The vine is not an oak tree to be unlimited in its expansive nature. Besides, the longer the branches are the greater the length of time required for complete maturity. *Est modus in rebus.*

Doctor Guyot, while rendering full justice to the inspiration of Father Denis, and approving it, could not believe in the distance of forty feet nor in the value of intercalary culture. He thought it preferable to plant the vines on one side of the field, in rows twenty feet apart, and the cereals and fodder on the other side.

"That is what will be done later on," said he, "in the case of vines *en chaintres* as well as vines *en jouelles*; for it is proved without doubt that intercalary culture does more harm to the vineyard than the fertilizing required in its case does good. The proximity of cereals and green fodder prevents the vine from setting well when in bud and when in flower while the vegetation is covering the ground, and the roots of the latter are injurious to the vine roots. The juice of the fruit that is obtained, too, will become acid and insipid. Therefore the vine needs arid soil, bare on the surface for a long distance, if the vines have large stocks, and for a short distance if the stocks are small. Now, in *chaintres* the main stems are from thirteen to twenty feet long; hence, that their production may be brought to perfection it is necessary that from sixteen to twenty feet of the ground around them shall be bare."

The prophecies of the illustrious doctor have been fulfilled; the distance between the rows has been reduced one half, and what is infinitely better, none of the ground is devoted to other culture; the vine alone occupies the whole of the land, at least after the first three years.

More than once have we seen vines become sterile in crowded plantations, owing to the lack of space, air, and sun, and old vines acquire new vigor and surprising fertility as soon as greater space was allowed between the rows and the vines.

In the environs of Levroux, where the *côt* is planted, as in Chissay, but with a space of hardly seven feet between the rows, and a little over three feet between the vines, this variety is not productive; the *jurancou* and *picpoule* are preferred to it. The *côt* requires long pruning, and in the space here allowed between the rows it is difficult to extend the canes; "hence," says M. de Gourcy, "the vines look sickly, especially when compared with those of Chissay."

The exuberance of production remarked in our vines is attributed partly to the superiority of the circulation of air, for the air circulates poorly in vineyards having, as a general thing, from 20,000 to 40,000 vines to the hectare (2½ acres).

Experience has proved that 800 vines to the hectare, planted *en chaintres*, yield twice as much as 10,000 vines planted in the ordinary way in vineyards of the same extent.

Chissay, essentially a viticultural country and of very limited extent, sees the number of its wheat fields decreasing every year; the vineyard invades every part of the territory, driving cereals and fodder before it.

As soon as one vineyard is set out, the owner of the neighboring land plants immediately in order to prevent his fields being depreciated by the roots of the adjoining *chaintre*. Vines on the border of a property are generally planted closer together than in the center.

Let us add that, according to the method of planting and with the spaces we have recommended, the soil between the rows may be sown the first year with wheat, the second with oats, and the third planted in potatoes; that is the order observed here. If the land is not rich, it has the advantage of not greatly exhausting the soil, which, as we have said, is not sown after the third year from the time the vines are set out.

We state what is commonly done at Chissay, but we do not mean that this rule is to be followed out everywhere. One could certainly, in the South, where there is less rain than in our countries, substitute for cereals leguminous plants fit for fodder, clover and sainfoin, wherever they will thrive, and the third year potatoes or beans, well fertilized.

The advantages of this method of culture is therefore incontestable, since, with it, the land never ceases to be productive. Hence, for thirty years past, all the estates of the commune, no matter of what kind, have doubled in value, and one of the most important causes of this great rise is the benefit resulting from viticulture.

CHAPTER III.

TILLING.

The soil, as Mr. du Breuil observes, like all land from which a harvest is expected, should be exposed to the fertilizing action of atmospheric agents. The development of any kind of parasites in it must be arrested. Then, too, it is well to protect it, as far as possible, from the effect of dryness during Summer. These divers results are obtained by means of plowing and repeated cultivation. These operations constitute the annual culture of vineyard soil.

The plow is now used much nearer the vines, leaving nothing, so to speak, to be cultivated by hand.

In the first plowing a furrow is commenced in the middle of the space left between the vine rows. In the second, on the contrary, it lays open the ground near the row, throwing the earth back on the vine—that is to say, it begins where it ended in the first plowing.

In countries where weeds spring up too readily, the soil might be cultivated after the second plowing, but with another implement than the plow. This work must not be done, if the fruit is already in an advanced state, for fear of the influence of torrid heat. All the canes should be carefully raised up for this work, or else the earth, freshly cultivated and warmed by the sun's rays, would surely burn the grape.

The soil should be plowed twice a year: first, by laying it open during the month of March before the vines begin to put forth their leaves; and secondly, by filling up the furrows, leaving one open in the middle of each space between the rows, which acts as a side canal when the vines are in blossom and when the frost is no longer feared, for a vineyard in which the soil has been recently cultivated is more readily affected by frost than that in which the soil has not been dug up. It would be of much greater advantage to plow three times during the year, and, in this case, the first plowing would be given after sowing time in the Autumn, and the other two at the periods we have just stated.

It is after the first cultivation, when the buds have grown about an inch or an inch and a half, and frost is no longer feared, that the canes should be bent down and the extremities fastened to the ground, by means of a clod of earth put on top of a little wisp of straw, which is twisted around this end of the vines.

After the second plowing, some think that it is well to harrow in order to preserve the freshness of the soil, to mellow it, and to lay it bare at every possible point to all the atmospheric influences. For this purpose they use the harrow made by Doumée-Pontleroy, the manufacturer of agricultural implements at Chissay.

This stirring up of the soil is advantageous for fructification and unfavorable to *coulure*. For this work all the arms of the *chaintres*—which after fifteen years should cover the sixteen and a half or twenty feet left between the rows, no matter what soil they are in—are taken up and moved aside.

Count de Gourcy, in the last volume of his travels, published in 1869, thus describes the manner in which this work is done: "Two or three times during the year the soil is cultivated with a small scarifier; that this may be done, one or two women, armed with wooden pitchforks, throw the canes over on the next space, and put them back in place when the work is done."

Mr. de Gourcy has been incorrectly informed on this subject. At Chissay wooden pitchforks are never used in turning aside the arms of the *chaintres* and putting them back in place. This work is done by hand, and generally by women.

Foreign viticulturists have spoken to us on this subject, and cannot understand how it is that by this method a great many of the buds are not broken off. Now, nothing of the sort occurs; this work is done without damage, with promptitude and facility, at a time when the sap of the vines renders its branches most supple.

Marquis de Ferrière, the owner of large vineyards at Chissay, and one who has endeavored to perfect the culture *en chaintres*, says on the subject:

The flexible wood of the vine, notwithstanding its length, is readily adapted to being turned aside and so exposing the soil. Both the plow, which is used instead of a pick for nearly all these operations, and the cart in which the fertilizers are hauled close to the vines themselves, then enter and move along readily in those wide spaces thus laid open between the rows. The work done, the canes are put back in their places, and you are puzzled, asking how it was possible to do this work, when the luxuriant vegetation has covered the whole ground with its long and stout branches, loaded with fruit and new wood. Away with stakes, iron wire, and the hard work of paling; the vine kept near the ground assures the maturity of the grape, preserves all the qualities of the wine, while the development allowed the canes lessens the danger of *coulure* and hastens fructification.

The operations by hand are reduced to three in number. *Marrage*, or putting the clods of earth on the ends of the canes, is done after pruning; about the fifteenth of May this work is sometimes done again. The third operation takes place on St. John's Day, and consists in breaking up the clods of earth. But in the culture of the vine *en chaintre*, the complementary hand labor of hoeing is reduced to almost nothing, thanks to the perfection in plowing, due itself to improvements recently introduced in the manufacture of vineyard plows.

At Chissay the practice of bedding up or ridging has disappeared, giving place to flat culture; nevertheless, for some time past we have seen, especially in young vineyards, and then only once in four years, the rows of vines form a ridge more or less convex to prevent the water from remaining too long on the roots.

[Mr. Vias describes a cultivator plow in use at Chissay, but the terms are too technical.—Translator.]

A single horse is hitched to this implement and plows over an acre a day in a vineyard in which the rows are twenty feet apart.

Intelligent viticulturists unanimously declare that the cultivation with the plow stirs up the soil better than hoeing usually does, and the rootlets of the vines dying off every year, there

is no great inconvenience met with in plowing up the spaces between the rows to quite a depth; nevertheless, the soil must not be plowed deep enough for the main roots of the vines to be touched.

What a great improvement, and what true progress, therefore, is the cultivation of vineyards with the plow! It is incontestable that there is economy of time and money in it, besides the work being done better.

However, the two-pronged hoe is still used here in hand labor, and especially on steep hill-sides, inaccessible to the plow.

Let us hope that in vineyards recently planted and properly laid out, the plow alone, rightly constructed, will do all the work, and that the pick will be used only in crowded vineyards.

However, the use of the plow in vine culture is not a new thing. Is it not said that in Provence they are using now a plow that is no other than the implement introduced of yore by the Romans in ancient Narbonuaise, and does not Virgil, the greatest poet of antiquity, in the second book of his *Georgics*, give advice for cultivating the vine, which the eminent viticulturists of our day would not disavow? It seems to us not only that the plowshare was used in Roman vineyards, but also that the young vines were set out in small trenches; that they could expect nothing from a vineyard exposed to the west, and that it was necessary to understand how to rid it of the fruitless luxury of tangled vine-branches.

However that may be, "the discovery of culture *en chaintres*," says Mr. de Ferrière, "has added considerably to the vitality of the vineyard, not only because in reëstablishing the net products it has increased the capital, but because it augments the ability of the small land-owner. The same man who with his pick worked two or three hectares of vineyard by the old method of culture, by the addition of a poor horse and a small plow, will easily manage ten now; the small land holding has increased its forces fivefold."

CHAPTER IV.

FOURCHINES.

In vineyards where the vines are not staked high, they must be held up by little forked stakes put in the ground to keep the bunches of grapes from touching the earth, where they would rot before arriving at maturity.

Cultivation over, after florescence, the branches are put on forked stakes about a foot high, called *fourchines*—*fourchettes* in the country.

They are notched on top, if not naturally forked. They are not put in deep; but still they must be firm enough not to be blown down in the slightest wind. Hence it does not suffice, as has been

stated, to simply rest them on the ground. They are made of all kinds of wood, and of all thicknesses. Usually there must be three to a cane; but when the fruit is on the point of ripening these supports must be placed wherever necessary, and those that are gone replaced,

FIG. 4.



Fourchine, or Forked Stake.

FIG. 5.

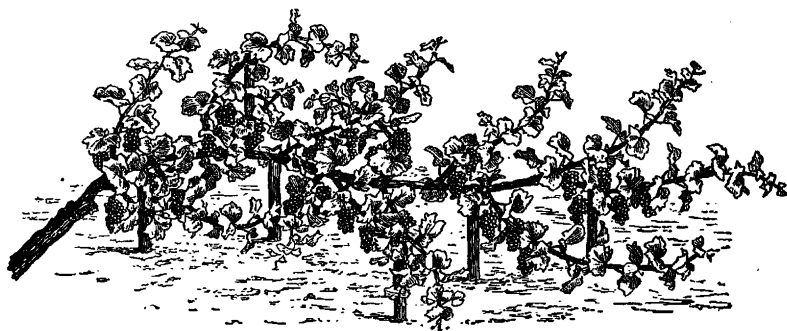


Fruit Branch supported by two forked stakes, after florescence.

in order that the bunches of grapes, when ripe, will not touch the ground; for it must be seen to that they are not soiled or rotted.

We give (Fig. 6) an arm of a vine *en chaintres* supported by *fourchines*, at the period of maturity of the grape.

FIG. 6.



Fruit Branch supported by forked stakes at the time of maturity of the grape.

The use of *fourchines* is not necessary during the first three years after the vines are planted; but the following years, the vines beginning to bear, about 2,400 per hectare should be prepared. Their number always increases according as the vines cover the ground. About the tenth year the vine is so well developed and the canes so numerous, that not less than 12,000 *fourchines* are needed to the hectare. They do not cost more than six francs per thousand, and last from three to five years, according to the quality of the wood that is used. The whole expense for *fourchines* would not exceed twenty francs annually.

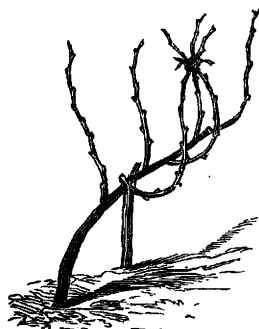
Experience proves that the buds nearest the earth are more easily affected by Spring frosts; it is, therefore, important, in order to preserve them, to keep the canes up some distance from the ground by putting a single *fourchine* under the vine near enough to the stock. If the canes are in danger of touching the ground they are held up by being fastened together with a wisp of straw (Fig. 7).

An able and intelligent viticulturist of this country has observed that bedding the arms of the vine in a simple furrow dug near the vine row, would suffice to combat the effects of late frosts; but this observation, made one year only, and on a few branches, should be renewed and tested faithfully. However, it might be of some importance, considering the excellent results obtained in Aube by an analogous method just put before the viticultural world by the *Journal d'Agriculture Pratique*. The experiment has been made near Troyes by Mr. Rousseau, Professor of Arboriculture, one of the most devoted members of the *Société Horticole*, vine-grower and forester of Aube.

Here is Mr. Rousseau's process: When pruning the long wood, commonly called the fruit branch, a little trench, about two and a half inches deep, is dug, and in it the cane is buried its whole length, care being taken to leave above ground the two upper eyes; that is to say,

the cane has been pruned so that it has two eyes more than in ordinary

FIG. 7.



Vine, as held by a stake during the time of Spring frosts.

pruning, and these two supplementary eyes are not buried, the extremity of the cane being raised up out of the ground. What will be the result? The two upper buds, favorably situated, will absorb the first sap and develop promptly, which will retard, correspondingly, the development of the buds under ground.

If there is frost, the upper buds will be attacked, while the subterranean eyes will be preserved.

Come what will, it will be necessary to take the branch out of the ground when the frost season is over. If the young buds on the extremity are frozen, they are suppressed—or else they will be pinched—as soon as possible, with the view of equalizing the vegetation of

the branches of the old wood, which will soon lengthen and bear fruit.

We see that the Rousseau process is based on the sacrifice of a few buds exposed to all inclemencies in order to save the others hidden in the trench.

In 1874 the work was done at the following periods: First, burying, the twentieth of February; second, exhuming, the twentieth of May. Burying then took place during the repose of the sap. All the vines operated on were covered with fruit as in good years.

The method of training the vine at Chissay could be perfectly applied to this process of preservation, if considered infallible by the Commission charged with making the necessary experiments for arriving at an incontestable conclusion; but we should prefer, assuredly, the method which we spoke of first as more expeditious, more practicable, and less expensive, its efficacy having been so well demonstrated to us by longer practice, rewarded with success. "It is not a matter," says Mr. Guyot, "of protecting the vines from the north winds, or from those from any other direction, in order to shield them from hoar frost, for even the very cold winds diminish instead of augmenting the danger. It is a question of interposing an opaque body between the clear sky and the plant to be preserved. This body hinders the radiation of heat from the plant into space, which does not give it back heat in return; while any opaque body placed above it prevents the heat of the plant being lost in space, and returns an amount of heat equal to that transmitted by the plant."

The canes placed in the trench are somewhat protected, it is true, but they are not completely covered and are too near the ground; a double reason for a greater quantity of dew being deposited there, and, if it is cold enough, the dew will be converted into rime or hoar frost, so much the more as there being no hindrance to nocturnal radiation, nothing will prevent the freezing taking place and the buds put forth will not be preserved.

It has been asserted recently that an infallible means of preserving vines from frost was to sow rape seed in the vineyard. This plant, sown in October or November, grows to about three feet high by the month of May; it thus protects the buds that are put forth; then it is cut down and the soil weeded. The vine, at first retarded, develops vigorously. The expense at the most is one franc per hect-

tare. The stalks of the rape, also, furnish an excellent fertilizer. It appears that with this treatment the ground shows no signs of white worms or other larvæ of insects, and it is asked if there might not be found in it a remedy for phylloxera.

Of all methods of supporting the vine, as Dr. Guyot informs us, that which affords a single stake to a vine is the worst, for, the branches being crowded around it, most of the leaves and often the fruit is deprived of air and sun; piling in a line is the best.

It was before he had seen our vineyards that the learned doctor spoke thus; but when he had assured himself of this splendid vegetation, and above all of this marvelous yield of fruit due to the new method of culture, here is the way in which he expressed himself:

Vines *en chaintres* are the highest testimony of the philosophy of the vegetation, fertility, and longevity of the vine, of which they are the best representatives, equal in this respect to trellises, the size and development of which they attain; instead of having short spurs like the vines supported by the trellises at Thomery, they have long and numerous fruit branches like those of Savoy and Isère. Moreover, in place of their being trained against a wall, or supported in the air by trellises, expensive to build and to keep in repair, they spread out freely over the bare ground cleared of weeds by plowing, harrowing, and rolling. The earth acts as a wall for the vines, and reflects the heat, a condition which, with reference to the perfection of the fruit, is much superior to insulation in the air, like the trellised vines of Savoy, Isère, and those trained on the trees and frames in the Upper and Lower Pyrenees, in Evian, Dordogne, and other countries.

The *fourchines* are taken up every year before Winter, and put here and there in little heaps kept up off the ground by means of four laths put under them in the form of a square.

Sometimes the precaution is taken to house them in order to protect them completely from moisture.

The reason the *fourchines* are taken up is to prevent the buried part from decaying during Winter, and to facilitate the work of pruning and plowing.

The *fourchines* are therefore the only means of support used here for the fruit branches. However, we sometimes see a few small stakes used to fasten the extremities of the long *chaintre* more completely, which might be blown to the ground by the violence of the wind, but the expense is not much. We do not know, as far as the results obtained are concerned, of a simpler and more economical process for vine-growers, as well as for proprietors having others to do the work for them.

CHAPTER V.

FERTILIZING.

Every vine should be nourished in direct proportion to the amount of fruit we wish to obtain, and in inverse proportion to the richness of the soil itself.

Sometimes excellent soil is met with that needs very little fertilizing; however, the space left between the vines allows them to vegetate longer, without becoming necessary to quicken the growth by fertilizing frequently. The relatively considerable space found between the vines in the rows, as well as between the latter, enables the roots to extend farther into the subsoil, which brings it to pass that these rows of vines, no matter how little the soil is fertilized,

which occupy about a fifth of the land, produce as much wine as a surface five times as large, and in which the vines are planted nearer each other; while good vine-growers use, every seven or eight years, an enormous quantity of fertilizers to render their vines very productive.

It suffices for the prosperity of our *chaintres* to fertilize at the rate of twenty-five or thirty cubic metres per hectare. The fertilizers cost from five to ten francs per cubic metre; that is, three hundred francs at the most for fertilizing one hectare, every seven or eight years, in soil of ordinary quality. However, rich vine-growers do not object to nourishing their vineyards with more than one hundred cubic meters of good fertilizers per hectare. It is difficult to state the exact quantity of fertilizing matter that should be applied to the vineyard; that depends on the richness of the soil, and the end one has in view. If quantity is sought for more than quality, we know that the more the vine is fertilized the more fruitful it will be, and the less quality will be found in the wine.

For fertilizing our vine-growers use furze and heather, which they go as far as the Berry to obtain, in order to get it cheaper. It takes them at least a day and a night to bring back a wagon load with their little horse or donkey (1).

Heather is highly esteemed in vineyards on the banks of the Cher. They also use branches of fir, bundles of brushwood bought in the neighboring forests. This fertilizer is particularly adapted to young vines. Of the trees and plants used in fertilizing, those that retain their leaves should be preferred; these contain a great deal of potash, which is particularly favorable to the fertility of the vines.

"The vine being a perennial shrub," says Mr. Guyot, "does not need a fertilizer that is decomposed and fitted to favor the rapid germination of an annual plant; it derives more benefit from those that are firmest and slowest in decomposing."

Generally heather and furze, before being used, are worked up and disorganized in the roads and yards, where they are pounded and broken up by cattle and carts. Some people, however, prefer for good reason to bury them while green, for the effect is then more lasting, and the vine adapts itself to it perfectly. This sort of fertilizing acts at the same time as a means of drainage. We know, also, that there is efficacy in renewing the soil, which yields excellent results in our vineyards, where it is practiced to a great extent. Let us mention the fact that soil from bottom lands mixed with lime is excellent to be put around the vines.

"A vine that has been fertilized in accordance with the soil in which it grows," says Abbot Frandin, "gives double and triple results. I use from preference chemical composts, and of such composts those that contain especially potash, phosphoric acid, and lime. Farmyard manure is not one of the best fertilizers for the vine, and it is the dearest of all."

This is also the opinion of Mr. Bernard, Professor of Sciences at *l'Ecole normale spéciale de Clunz*, who declares that chemical composts are of great saving, for they act promptly and lessen the amount of hand labor required, and which is so dear now.

Lime is a good thing for vines; guano is also used with success, allowing to each vine about two ounces, which is applied before cul-

(1) Father Denis did not fertilize his *chaintres*, "because," said he, "the vines, being very far from each other, can, without suffering for nourishment, send their roots a great distance."

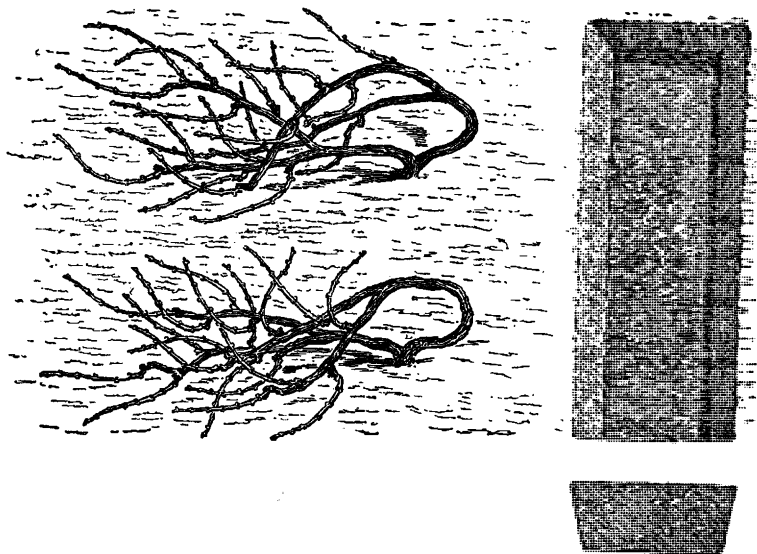
tivation. To fertilize one hectare completely requires 2,000 fagots of furze, which costs 320 francs and the expense of freightage; but it takes the place of at least 100 metres of fertilizing matter, which would cost 500 francs, and the cartage of which would be more expensive.

When farmyard manure is used, it is spread over the ground, as in an ordinary field, and buried in the soil by plowing.

In the old method of culture, it took eight hundred francs to fertilize one hectare, every eight or ten years in good soil, and in poor land the same amount every four or five years. In vineyards cultivated *en chaintres*, this expense is unnecessary, and great economy results, as we have said, from the fact that the vines being far apart, their roots do not at all feel the need of nourishment, as occurs in crowded vineyards.

It is important to say that the vines are fertilized after the fall of the leaves, and this work is done by burying, on one side of each row, in trenches about two or two and a half feet wide, generally dug at about one and a half feet from the row of vines (Fig. 8), the woody fertilizers which we have mentioned, and which add singularly to the forces of vegetation and fructification of the vine. Nevertheless, it is just to observe that the distance of the trenches from the vine row depends upon the age of the vine; that is to say, the younger the vine, the nearer the fertilizer should be to the row; on the contrary, the older the vine is, the farther it should be from it. Thus, when the distance between the rows is twenty feet, seven years after the vineyard is planted, and even sooner, according to the vigor of the vines, the fertilizing material is distributed at the bottom of a trench dug in the middle of the space that separates the rows. That is said to be the best method, because, it being necessary that the fertilizer should be brought within reach of the extremities of the

FIG. 8.

Method of fertilizing vines, *en chaintres*, in Chissay.

roots, and the latter being very long, the fertilizer should be buried at some distance from the row.

All the savants, however, are not of this opinion; some pretend, on the contrary, that it is better to fertilize the foot of the vine. The *Journal de l'Agriculture*, in 1869, published an article on the subject, from which we extract the following:

Among the divers methods of fertilizing vineyards, the most common is to deposit the fertilizer in a hollow made at the foot of each vine. It has been tried to put it in other places; for example, in the intervals between the vines in the rows, and sometimes in the wider spaces that separate the rows, in vineyards where the plow is used. But whatever method may be used, they always end by coming back to fertilizing at the foot of the vine. Is that because this last method is the easiest to practice, and less costly as regards hand labor or fertilizing matter? Is it simply the result of habit? I was asking myself the question, when a new light was thrown on the subject in reading a memoir on the physiology of the vine, by Mr. de Vergnette-Lamotte, correspondent of the Institute.

The eminent viticulturist has observed that every year, in the month of May, just before the vine blooms, it puts forth, at a little depth, several tufts of roots, generally quite vigorous. This beard of roots dies off in a great measure before the fall of the leaves. The rootlets or fibers composing it have thus only the ephemeral existence of the leaf of the plant, seeming to obey a sort of law correlative to the life of the organs of vegetation.

Might it be that the physiological fact observed and thus described by Mr. de Vergnette-Lamotte is accurate? As a matter of prudence, it was my duty to verify its existence before making any induction whatever. The examination of a certain number of vines, made at the end of Spring and of Autumn, assured me of the birth at the first epoch, and of the death at the second, of this beard of rootlets. Having consulted authors who have treated on vegetable physiology, I found that most of them, in speaking of the beard and the fibers of the roots, grant them only a temporary existence. Even simple practitioners of arboriculture, whom I have interrogated on this subject, agree with the opinions of the authors and the observations of Mr. de Vergnette-Lamotte.

Hence, the putting forth and the duration of the fibers is closely connected with the evolution of the leaves and fruit, and the latter must profit in proportion to the abundance and vigor of the beard that is put forth and disappears with it. Fertilizing at the foot of the vine, there where Mr. de Vergnette-Lamotte has particularly remarked the development of a special beard just before the vine blossoms, therefore, would be justified; consequently, the preference accorded this method of fertilizing would be explained.

Nevertheless I wished to have the proofs for myself, and, with this view, I had to find out whether the vines or stocks fertilized at the foot would have more of a beard than those not fertilized, or only fertilized at a distance. All doubt was cast aside; there was a much greater quantity of the fibers on the foot of the vines thus fertilized. There was the same difference in the amount and size of the grapes.

There is another point to be considered. When devoting oneself to finding, under the names of special fertilizers, those that, by their elementary composition, are best adapted to each species of plant, it will be of no disadvantage to know what must be the most suitable fertilizer for vines, either for forming their framework, or for the production of fruit. There would be the interesting researches on the culture of the vine by Mr. Persoz, professor of chemistry, to be consulted on this subject. Mr. Persoz has proved, by direct experiments, that it is possible, by means of special fertilizers, to obtain from the vine at will, in the first place, an abundant production of wood, in order to build up the vine rapidly, and then to obtain from the latter a preponderous yield of fruit. For the production of wood, he used a mixture composed of sixty per cent of pulverized bone, thirty per cent of parings of hides, debris from the tanyard, horn, and hoofs, and ten per cent of plaster. These materials, well mixed, were incorporated in the soil to the depth of from two to three inches. The vine being formed, the grape had its turn. Mr. Persoz confined himself to the mineral matters that enter most into its composition: these are salts of potash. He distributed around the foot of the vines, in a hollow, a compost consisting of a mixture of seventy-five per cent of silicate of potash and twenty-five per cent of super-phosphate of potash and lime. Finally, to keep up the production, he advises putting every year, at the foot of the vine, the residuum of the vintage; this residuum contains twenty-five per cent of carbonate of potash.

Considering Mr. Persoz's system, the fact revealed by Mr. de Vergnette-Lamotte is of importance, it seems to me, especially in regard to fertilizing at the foot of the vine, but practical experiments must be made, and I here express the wish and hope that they will be made by willing viticulturists.

It is not for us to judge the different methods of fertilizing; our task is simply to spread abroad our methods of culture, if fruitful in their results.

CHAPTER VI.

PRUNING.

After being planted, all the cuttings should be topped with the pruning shears, leaving only the eye nearest the ground. We say with pruning shears, although nearly all our vine-growers use a pruning knife; but an attempt is being made to replace this instrument by the pruning shears, such as are used in the environs of Blois, and which, according to Mr. Guyot, should be preferred to the knife for pruning vines, notwithstanding the contrary opinion expressed by meritorious vine-growers and professors of arboriculture of incontestable authority. The vine-growers and professors, says he, are right as far as they are concerned, for, thanks to their skill and long practice, they prune better and more quickly with the knife than with the shears, and never wound the tree or vine, which nearly always happens when they use shears; but when the pruning is done by a number of workmen, and by the first ones that come along, the shears permit a promptitude and sureness in pruning that two years' use of the knife does not give to an ordinary workman. As for the bruises made by the shears, the vine is so robust that it suffers little or nothing from them.

In general the head of the vine lies, so to say, on the very ground; for the Spring frosts are hardly to be feared here. This position, moreover, has another advantage, in that the nearer the canes are to the ground, the less they are attacked by *oïdium*.

We have said that for several years the *chaintre* method has been essentially improved, and that the soil is now plowed up to the foot of the vines. We owe this improvement to the promptitude used in

FIG. 9.



Branch after pruning.

the arrangement and definitive formation of the stock and head of the stem, which is now formed at a distance of not more than two and a half feet, and, in some vineyards, a little over three feet from the foot

of the vine, so that the third year after plantation, the stock is formed, and the framework of the vine begins to assume its shape.

By forming the head of the stem is meant crowning this stock with two, three, or four arms at the most, either on the surface of the ground, or at from one to two feet or more above the ground.

This practice has the advantage of promoting good production, and greatly facilitates turning aside the arms of the *chaintre* in preparing for plowing. Then the vine is formed on one or two principal arms by as many long canes, serving at first as fruit branches.

"On these branches," says Mr. Guyot, "is put forth the fruit and new wood; one cane of the latter is chosen as a prolongation of the arm, and one or two spurs are left for lateral branches (Fig. 9) the next year; it is thus that the arms are lengthened successively to sixteen or twenty feet, while preserving the points where the lateral branches grow out. These long arms can be and are often shortened to be remade in the same manner."

There is in this, according to the doctor's observation, a very rational method of training, well adapted to maintaining great vigor and remarkable fertility. "It is only necessary to see," says he, "to be convinced that the less development we allow the vine, the more we enfeeble and sterilize it, and the more we shorten its existence. All that is natural, normal, and in the physiological development of the vine; the larger a tree grows, the more eyes it bears; the more new wood it puts forth, the more fruit it yields, until it has reached its limit of arborescence, relative to the soil and the climate. At that point it remains stationary, in the adult state, producing regularly the same wood and fruit for a long time, for centuries, if the soil is propitious. But wherever it may be situated the most generous pruning will always be more favorable and more remunerative than the most limited, all other conditions being the same."

The *côt* requires long pruning, and it is this variety that is best adapted here to this sort of culture. As we have said, it is not the only one, however, that may be chosen.

The vine is formed as soon as it shows a suitable arrangement of canes, and is often supported by a stake during the first years. This practice is excellent, and should be adopted by all vine-growers. The advantages that would be derived from it would well compensate for the slight increase of expense and labor. In fact, by the time the vine has canes three or four feet long, there is no longer any need of the prop (Fig. 10), and the flexible and properly trained canes, without any trouble, will take the direction desired for them. On the contrary, if the stock is allowed to lie flat on the ground, the buds, tending to develop vertically, will take the direction indicated (Fig. 11), instead of developing in the horizontal direction of the young stock.

At Chissay they begin to prune the vine in the month of December, and continue it until February. The principal object in view, during the first years, is to strengthen the stock, in order to obtain vigorous new wood. Hence, the very year the vineyard is planted the new cane is topped, so as to leave only two or three eyes above ground (Fig. 12).

FIG. 10.

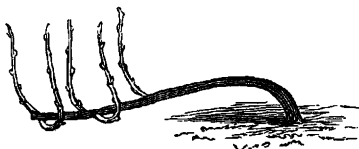


Young vine supported by a prop.

First Pruning.

The vine is one year old, and we suppose it was already rooted when planted. In pruning, all the new wood of the first year is cut off short, only one cane being reserved—the most vigorous and the nearest the ground—which is topped so as to leave only one or two eyes. Thus (Fig. 13) the cane *A* will be chosen, which will be pruned at *B*. Thus the work is proceeded with until the stock is sufficiently vigorous to put forth canes about three feet long.

FIG. 11.



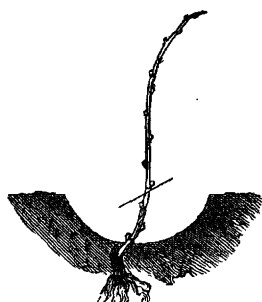
Young vine lying on the ground.

That the method of pruning may be perfectly understood, each of

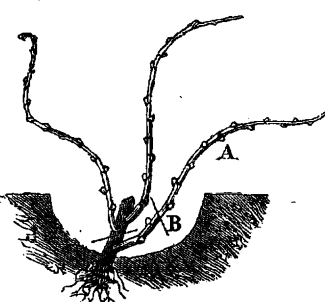
the divers operations necessary is illustrated by an engraving. We

FIG. 12.

FIG. 13.



Year of plantation.



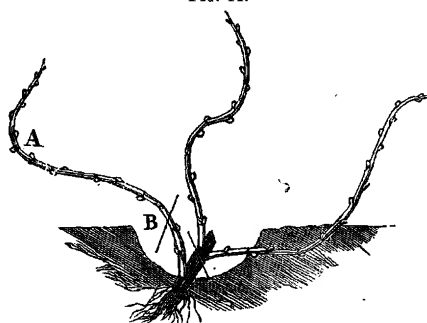
First pruning (second year).

and the cane of the third year appears really to spring from the ground when the vine is covered up again.

Second Pruning.

The lost vines are replaced by very vigorous plants, in order to maintain uniformity in the vineyard. The vine is two years old. In

FIG. 14.



Second pruning (third year).

below them are suppressed during the time of their development.

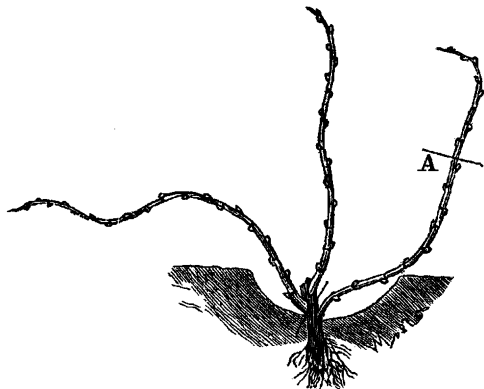
Third Pruning.

As a cane has been put forth at each of the eyes reserved in the second pruning, the one that is strongest and the nearest possible to

should state that before pruning it is customary to scratch around the foot of the vines with the implements *ad hoc*, in use here, so that during the first years the eyes developed on the vine below the level of the ground do not form any nodosities on the stock, as might be thought,

the ground will be reserved and topped at a height of about three feet (Fig. 15), at the point

FIG. 15.



Third pruning (fourth year).

put forth canes of this length, it would be necessary to prune as in the preceding years.

When the vine is to have two arms, all we have to do is to leave two canes instead of one, and they are both pruned exactly alike.

Some vine-growers advise bending down the cane destined to form the main stock of the vine, in the direction of the vine row, during the month of May, and fastening the extremity down with a clod of earth, so that it will not have to be disturbed for cultivating. This advice, better appreciated now, is followed in recently planted vineyards; it has the advantage of giving the vine that slight curvature which enables it, when grown large, to be moved even beyond the vine row to give the plow plenty room. But this practice cannot be of long duration, and cannot be carried out when the vine begins to furnish fruit branches; it is best then for it to take the direction it is to grow in over the ground. This lowering of the vine stems occurs when the new shoots are about an inch or an inch and a half long. It is then also that the prop may be dispensed with.

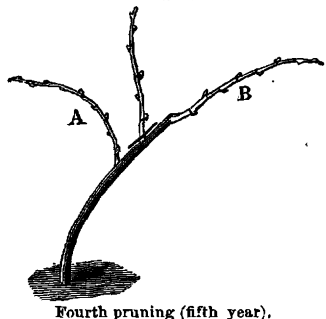
Fourth Pruning.

It is time to begin to form the arms of the *chaintre*. On this cane, about three feet long, which was reserved in the last pruning, and all the buds of which have been suppressed to a height of about two feet, two or three of the new canes will be reserved, according to the strength of the vine—for example, the canes *A B*, (Fig. 16)—and the other will be cut off.

The cane of the preceding year will form the stock of the vine, as the new cane at its extremity will prolong this cane the following year.

In order to be better understood, we shall now give a representation of a vine before pruning and of the same vine after pruning. After the fourth pruning the vine will appear about as is represented in Fig. 17.

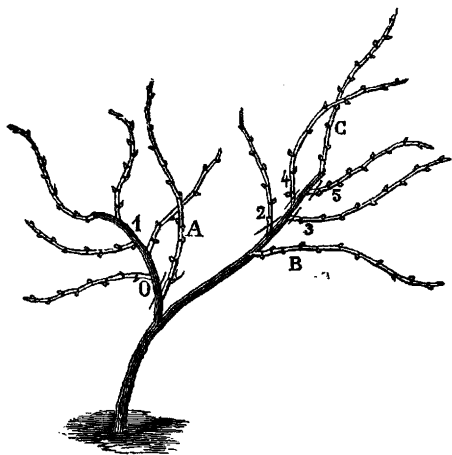
FIG. 16.



Fourth pruning (fifth year).

must be well cleared of suckers, and the fruit branch topped at about two thirds of its length, in localities where the vegetation is vigorous, and in others, only six nodes are taken off at the extremity of the

FIG. 17.



Fifth pruning (sixth year). Vine as it is before being pruned.

reference to some one who knows nothing about the culture of *chaintres*.

We should state that a certain number of distinguished viticulturists of this country, in order that the stocks may be more flexible and less resistant when they have to be moved out of place, begin first to bend them in a direction contrary to that which it is desired they should take. But this process is left to the appreciation of the practitioner.

Fifth Pruning.

We said several years ago that there were two different methods of pruning: one consisting in lengthening the main stem of the vine, not allowing it to increase in size laterally; the other, on the contrary, allows it to branch out on each side to an unlimited extent, with lateral arms spreading freely, and bearing a greater or less number of fruit canes. This last method, it is easy to see, has the disadvantage of rendering it more difficult to move the vines aside, as is necessary for plowing; hence it is completely abandoned nowadays.

In the Spring, and later, if necessary, all the suckers must be removed from the foot of the vine; that is, all the disbudding that has to be done, and it is only there, so to say, that it is done.

From each stock, says Mr. Duclaud, extend two arms, all the buds of which, for nearly three feet, are rigorously suppressed during the first years, in order to prevent the formation of knots, which would render the aforesaid arms inflexible. It is important, in fact, to be able to handle them, and turn them about as you would a cable. In pruning, the stock of the vine

must be well cleared of suckers, and the fruit branch topped at about two thirds of its length, in localities where the vegetation is vigorous, and in others, only six nodes are taken off at the extremity of the branch. Thus one third of a well developed branch is cut off; if this branch does not exceed four feet, only one or two nodes need be cut off. The vigor of the vegetation determines the number of nodes to be taken off. Mr. Cazenave, in his *Manuel Pratique de la Culture de la Vigne dans la Gironde*, mentions having seen a considerable number of branches more than eight feet long, and says that the vine-growers at Chissay maintain that they should not be topped, even if they were ten feet long. We have never heard experienced vine-growers say that. Mr. Cazenave, no doubt, has reference

We shall occupy ourselves, therefore, only with the first method, as being the most rational, the easiest to apply, and the most advantageous for our culture.

Then, too, the vintage could be increased by liberal pruning, provided care was taken that no spurs are left; but, besides the produce, we seek at the same time for the best and most practicable method.

Therefore, branch No. 1 (Fig. 17) will be cut off at the point indicated by *O*; Nos. 2, 3, 4, and 5 will also be cut with the pruning shears at the points indicated, so that the vine will have left only the three branches, *A B C*, as is shown in Fig. 18.

Each time the vine is pruned the same length must always be allowed the canes that are reserved; in other words, say they are left entire, only a few nodes being cut off at the extremity.

In this method of pruning, therefore, when suckering we should not destroy the shoots on the canes that are to be reserved that are nearest the main branch, and that are best situated. Although they are not very productive, they will make excellent fruit branches the following year.

FIG. 18.



Fifth pruning (sixth year). Vine after being pruned.

Sixth Pruning.

FIG. 19.

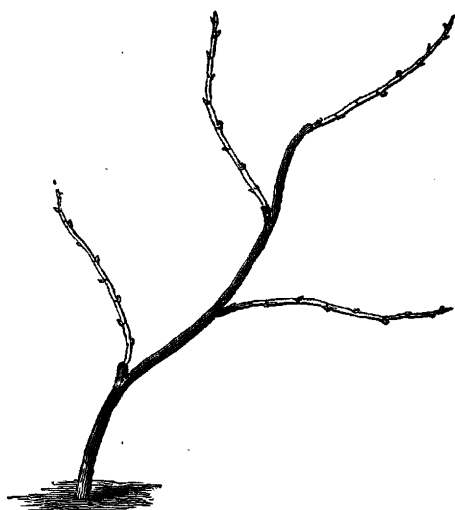


Sixth pruning (seventh year). Vine before being pruned.

This pruning differs little from the preceding. Thus the cane on the lateral branches that is nearest the main arm is left, as in the fifth pruning; only, at the top of the principal stem, one or two canes, according to the strength of the subject, might be left for fruit branches. Thus (Fig. 19) the two lateral branches will be cut at the points *A* and *B*, and on the upper part of the principal arm the canes *C* and *D* will be reserved, and the others cut off, so that the vine will

have four branches (Fig. 20).

FIG. 20.



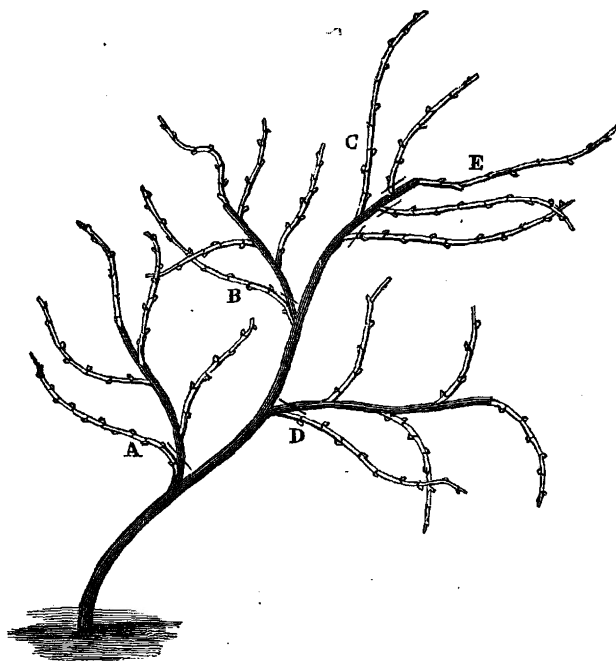
Sixth pruning (seventh year). Vine after being pruned.

If, on any of the lateral branches, the cane nearest the main arm proves feeble and paltry, it is not necessary to keep it, but the second cane may be used to replace that of the preceding year. As this method, as the years go by, tends to separate, more or less, the fruit canes from the principal arm, if a sucker is developed on the latter in good position, and not far from one of these canes, it must be carefully preserved; it will replace advantageously the cane nearest to it. So if the distance between the two canes was too great, the sucker developed in the intervening space would be left, and cut off so as to leave two or three eyes.

Seventh Pruning.

The seventh pruning is similar to the preceding ones. That is to say, that on each branch, the cane nearest the main arm must be

FIG. 21.



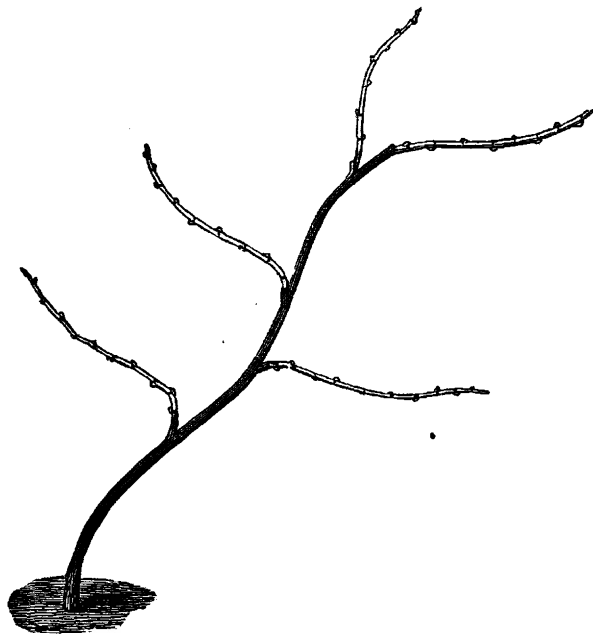
Seventh pruning (eighth year) Vine before being pruned.

reserved. Thus (Fig. 21), the canes A, B, C, D, and E will be reserved, and the branches and canes to be suppressed will be cut off at the points indicated. Fig. 22 represents the vine after it is pruned, and Fig. 23 the same vine after vegetation, and also shows the canes to be reserved at the next pruning. If the vine has two arms, instead of one, and we wish to keep both, one is directed to the right of the row and the other to the left, or both on the same side, if it is on a border line.

The vine having arrived at its perfect state, all subsequent pruning will be done as has been described; nothing remains but to favor the elongation of the main stems until the ground is covered, and to augment, little by little, the number of branches, so as not to hinder the regular vegetation of the vines. At the age of twelve years, when the soil and fertilizers still add to its vigor, the vine is able to sustain from twelve to fifteen canes.

The arms of the *chaintre* are then lengthened until they are sixteen feet long, and even more; as far as possible a fruit branch is left

FIG. 22.



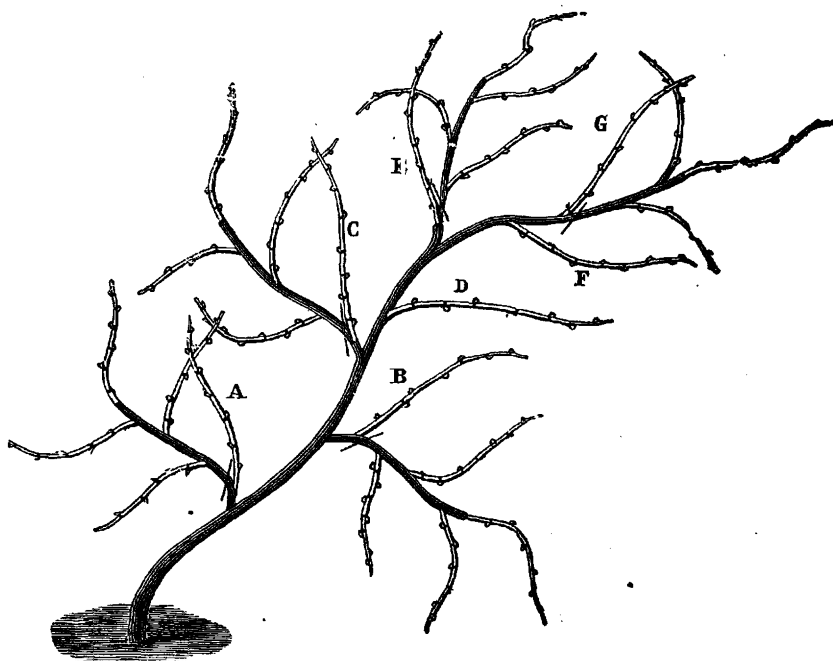
Seventh pruning (eighth year). Vine after being pruned.

very little influence on the vintage, which is an enormous advantage."

on them at every 16 or 20 inches, and all the useless shoots are carefully suppressed before the rise of the sap.

"We see," remarks Dr. Guyot, "that half, or at least one third of the numerous eyes of these canes are not developed when the sap first rises, and that, if the Spring frosts destroy those that are developed, the dormant eyes replace them immediately, taking possession of the abandoned sap; so when this method is practiced, the Spring frosts have

FIG. 23.



Eighth pruning.

The vine being vigorous, if it should hail, we must prune back on the green shoots up to the end of July; the serious effects of the hail on the wood of the following year will thus be avoided.

Doctor Guyot gives advice on the subject of pruning which may be very useful to vine-growers, and which we think it would be well to give here:

Persons who leave only one eye in pruning are wrong; those who leave two generally have twice as large a vintage. Fine varieties should be allowed as much wood as possible; consequently, it is necessary to leave sufficient space between the vines which become entangled when too near each other, and are thus deprived of air and sun.

In pruning the vine the pruning shears must cut in two the bud next to those that are to be reserved; the eyes are without pith, but when the pith is cut into we destroy that part of the cane above the eye that is reserved, which injures the vine.

This long pruning which we give the vine is perfectly adapted to it, and far from enfeebling it, only renders it more fertile and vigorous. Have we not seen here and elsewhere, old vines entirely exhausted, restored to energetic life by discontinuing short pruning, and allowing their canes to grow longer? The learned Payen should not have been astonished, therefore, that a vine of the *pineau* variety, perfectly sterile while pruned short, suddenly acquired remarkable fertility when allowed to spread over a trellis. Doctor Guyot says that Mr. Becquerel has communicated a similar fact to the *Société Centrale d'Agriculture* of France. This learned observer had in his garden several vines of the *pineau noir* variety, which were pruned short and never bore; he trained them over trellises, and they were covered with fruit, not only without being weakened, but being rendered still more vigorous.

CHAPTER VII.

TRANSFORMATION OF OLD VINEYARDS INTO VINEYARDS EN CHAINTRES.

We have already said that a certain number of proprietors were not content to adopt this culture in planting out new vineyards, but were induced to tear up three rows out of every five in their vineyards planted according to the old method, especially when they were beginning to fail. May we be permitted to give some advice on this operation.

This is what is usually done the first year of the transformation: the number of vines is reduced one half; that is to say, two out of every four rows are taken up. Then, in the first pruning, that cane or branch of the current year is selected that is most suitable, and situated on the side opposite to the direction which it is desired it should take, and that is the nearest possible to the ground.

But if the head of the vine was too high from the ground it would be better to take a shoot coming from the root or from the stock to form the new framework of the vine, than to confine oneself to a cane already forming a *chaintre*, but not flexible, that was too high up on the stock, and which one would be afraid of injuring every time it had to be turned aside for cultivation.

One thing must never be forgotten, and that is that all the sprouts on the new stem, up to a height of a little more than two feet, if it will allow of it, must be suppressed, and only three or four terminal eyes left for vegetation.

The following year the vines will be pruned as we have described for vines *en chaintres*, and the rest of the vines that are to be done away with are dug out.

This method of reconstituting a vineyard is of great importance in a time when phylloxera threatens to ruin our country. Such is the opinion of Mr. E. Rouyer, Engineer of Arts and Manufactures at Saintes:

The transformation of our vineyards into vineyards *en chaintres* is apparently easy and inexpensive; all that is necessary is to cut down pretty close to the ground, one row out of every six, which will be carefully tended to and thinned after vegetation begins if the canes are too numerous. In this way the Winter egg (reference is made here to phylloxerated vineyards) will be destroyed on these vines, and when vegetation begins it will not be deposited on them again, as this egg is never laid on wood of the current year. In all probability a good fertilizer, one half being farmyard manure and one half mineral compost abounding in potash increased by one fifth of superphosphate of lime, will carry these vines that were cut down to their third year, without necessitating an expensive treatment to defend them from phylloxera. The second, or at most, the third year, the two rows next to the one cut down will be dug out, and so from year to year until only the vines that were cut down occupy the land.

This is the hypothesis, but a trial of it is inexpensive, and in presence of certain destruction of our vineyards, is worth being undertaken.

CHAPTER VIII.

SUCKERING, OR REMOVING REDUNDANT VEGETATION—STRIPPING OFF THE LEAVES.

Pinching, or Summer pruning, which consists in suppressing the point of the shoots, is not practiced in Chissay. It is not so with suckering, or the removal of redundant vegetation, an important operation,

which is performed at the end of April in precocious vineyards, and repeated in June and even July. In new vineyards, the vines are treated to this process as soon as vegetation begins, and again when they have attained a height of from four to six inches; lastly, when they are in blossom. This operation, moreover, is performed quickly and without much expense, when the soil is being cultivated by hand, and we have already said that it was executed only on the arm of the vine for a little over two feet from its base and not on the new wood. The object is to maintain the integrity of the stock as well as of the arm, and to rid them of a useless and greedy vegetation, thus benefiting the upper buds that are destined to constitute and prolong the arms of the vine.

In our vineyards, where vegetation is very vigorous, it is very important to strip off some of the leaves when the fruit is about to ripen. It is essential in this operation, which improves the quality of the grape, to remove only the leaves situated immediately above the bunch of grapes, not touching those alongside of it.

"It is apparently forgotten," says the author of the *Ampélographie Française*, "that stripping off the leaves is especially advisable in cold damp years; that it must not be done until the grape is nearly ripe; that it must be done with a great deal of moderation in extremely warm climates where an excess of vegetation is rarely to be feared, and that, in any case, the leaf stem must not be taken off with the leaf, under penalty of depriving the buds of the nutriment conveyed to them by this protecting organ."

Topping differs from pinching, in that the latter suppresses only the terminal bud of the young cane, while the former cuts off a fourth, a third, or a half of a full grown cane. Topping in this way is not practiced in our country; but it often happens that the vine, exhausted by time and long producing, needs to be rejuvenated. An old vine cut down to the stock, seldom fails to produce vigorous canes, which restore its youth; it is this operation which supports and regenerates the vineyard by reconstituting the arms of the vine, that we call *recepape*.

CHAPTER IX.

TRAINING THE VINE.

Training the vine, it has been said, is independent of pruning; a vine may be pruned according to different methods, without in any way modifying the shape in which it may be trained conformably with the circumstances and local custom.

There is the method *en tête de saule*; the method *à cordons*, on stakes and iron wire; the methods *en haies*, or *en jouelles*, and that *en treilles*, having several arms with supports.

The first method requires the use of stakes; it is tedious, costly, and difficult, and is sometimes inconvenient, in that it shuts out air and sun, especially when the canes are twined together and bound around the same stake. The second method of training the vine, which is Dr. Guyot's, does not exclude stakes, for it necessitates the use of 10,000 large and 10,000 small ones to the hectare (about 2½ acres) and about 3,465 feet of iron wire. Mr. Guyot's principles are for the most part those of distinguished viticulturists, and experience proves that

this method gives results that are much superior to those of ordinary culture. However, vines *en chaintres* produce, at the least, as much as those trained according to this method, and have the immense advantage of costing infinitely less in the matter of planting and caring for the vines.

Let us hear what Mr. Duclaud, of Mettray, member of the *Société d'Agriculture d'Indre-et-Loire*, says on this subject:

I do not deny, that paling with iron wire is eminently advantageous for giving the fruit plenty of fresh air, and, consequently, for its maturation. But in using this method, everything must be done by Dr. and Cr. Now, iron wire, which does not dispense with stakes, more than doubles the expense, already so considerable, of first laying out the vineyard. The expense of hand labor, in paling, is increased more than tenfold—every cane having to be bound separately to the iron wire—while in districts where tying (*liage*) is practiced, all the canes of one vine are fastened to the stake at the same time and with the same piece of rope, rye or oat straw, rush, hemp straw, etc. Then, where manual labor is scarce—and where is it not?—it is almost impossible to use iron wire with advantage, owing to the time required by its use.

There are many other inconveniences met with in the use of iron wire, to detail which would seem childish to readers who pay no attention to viticulture, excepting to regard it as a fine picture-book, to sit by the fire and look at. But he who directs his vintagers himself, who superintends his workmen, who himself uses the pruning knife and shears, he it is who will understand me, who will agree with me, and whose approbation I desire.

Generally, the workman regards iron wire with profound antipathy, and I might add, if not exactly just, there is at least some foundation for this disfavor. If he wishes to thoroughly weed around the foot of the vine with his pick, he cannot do it. The iron wire prevents his using his tool on all sides of the vine; he can only dig on one side and has to wait, to finish it, until he attacks the ground from the other side of the iron wire, which now stands in his way. If he wishes to stop work or to resume it, he has a long way to walk around, as he must not climb over the wire.

This inconvenience is still greater in vintage time, when, with a basketful on his back, he is forbidden to take a short cut to reach either the wagons bearing the vats, or the wine press. The grape pickers themselves, whose work is facilitated partly by the paling, find it a hindrance when they wish to take their tray to empty it in the general basket. The tray has to be passed from hand to hand, like a bucket of water at a time of fire, first full, then back again empty; and see the waste of time in the case of the five or six men who are employed to fill the basket. I repeat that we cannot overlook these inconveniences of this method, for they are of no little consequence.

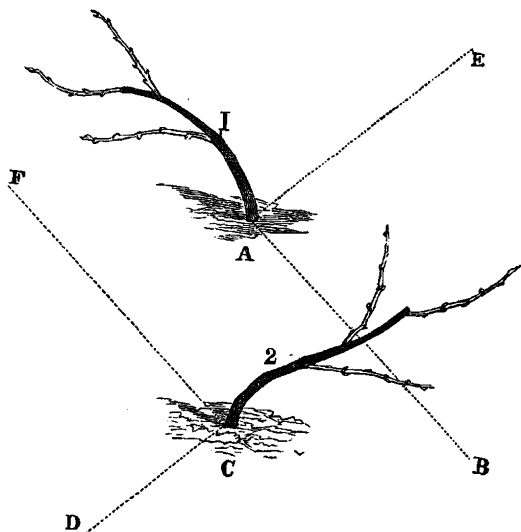
In training the vine according to the method used in Chissay, not one of the inconveniences just enumerated is met with.

The method *en haies* or *en jouelles*, like that *en treilles*, which is closely allied to it, has, without doubt, great advantages; it permits the use of the plow and also lets the air and sun in on all sides, but it necessitates either the use of props, of stakes and iron wire, or of poles.

It remains for us to make known the different methods now in vogue of training the arms of the *chaintre* which at first were extended over the ground perpendicularly to the vine row. Our vine-

growers had not begun to work with an eye to rational culture;

FIG. 24.

Method of directing vines *en chaintres* in Chissay.

what they were most concerned with was trying to augment their vintage by every possible means. However, there were some among them who, while endeavoring to obtain a good vintage, also had an eye to regularity, precision in pruning and shaping the vine, and a practical method of direction which facilitated moving these vines, with their long and numerous arms, out of the way of the plow. Thus we have seen vines *en chaintres* extending their arms obliquely at a distance near enough to the row; and in order to preserve the suppleness and elasticity of the

arm, care was taken, at least during the first years, to bend it sometimes in one direction, sometimes in another. Thus, in Fig. 24, vine No. 1 could extend in the direction *A B*, and vine No. 2 in that marked *C D*, and the same for the other vines in the row.

Vine No. 1 can also be extended in the direction *A E*, and vine No. 2 in the direction *C F*. This is, moreover, the simplest and most rational method as well as the one most in use.

Mr. Cazenave advises shaping the arm of the vine, near the ground, like a swan's neck. He says he was enabled to verify its great advantages in a vineyard in the environs of Chissay, where this method is followed out on a grand scale. He asserts that this shape gives to the vines the suppleness necessary to facilitate their being frequently turned about. We do not agree with him. The frequent turning about must, in twisting it, materially injure the vine at the point where it is shaped like a swan's neck.

On the other hand, those at Chissay who had adopted this method found out its defects in the severe Winter of 1879; the swan's neck, being higher up from the ground than the other parts of the vine, was completely frozen, and the vineyards had to be all torn up. It is important that the vine should run on the ground from the point where it starts.

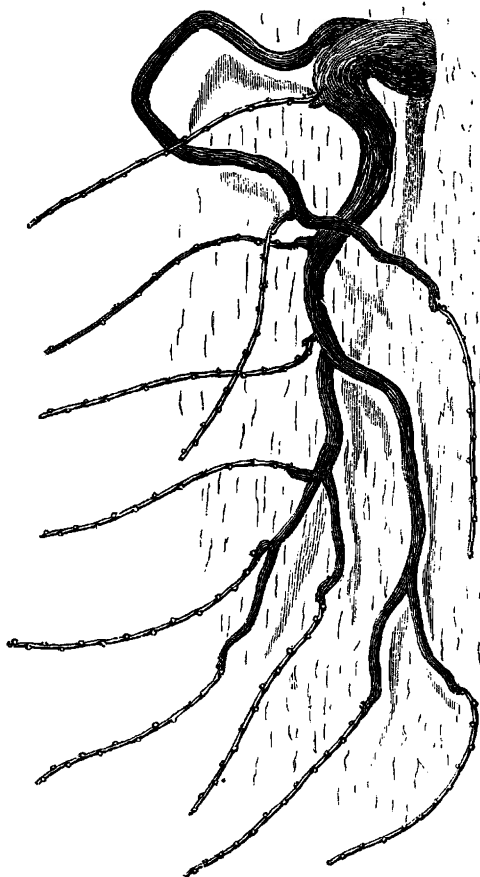
One method which our ablest vine-growers still advise using, which we spoke of in the third pruning, and which tends to become general, consists in training the vines during the first years in the line of the row, taking care to bend them in opposite directions in the different rows; that is, in the first row the vines will be extended up the line, and those of the next down the row; or, if the *chaintre* has two arms, one will be bent over below the vine, and the other above, the two being in a straight line. When, later on, the vine is formed and spread out over the ground, it will always be to the left of the plow

that it has to be turned. The simple laborer will often understand the economy of this method better than the vine-grower himself. Mr. Duclaud, after a visit made to the *chaintres* district in 1877, wrote as follows:

These two arms follow the direction of the row itself, one in front of and one behind the stock, the two forming a line slightly oblique with reference to the vine row, and they are so placed that if the plow grazes them, it is not the wrong way of the buds or canes, but on the contrary, it rubs against them in the direction in which they are growing.

Our vine-growers were not slow in perceiving that the formation of the branches near the base of the vine rendered it difficult, in the course of time, to turn the arms of the vine properly, in order to afford plenty room to the plow and permit a close approach to the

FIG. 25.

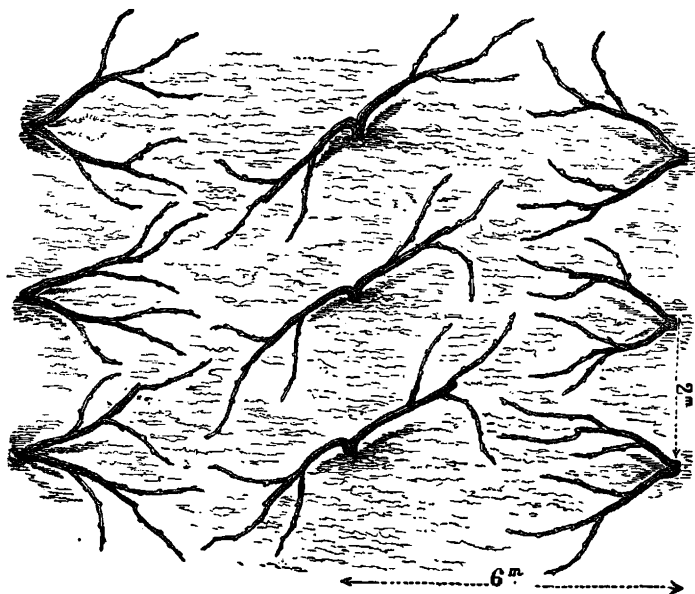
Vine *en chaintre*, one fiftieth the natural size, fifteen years after planting.

vine rows. In fact, in the first plantations *en chaintres* the vines are as represented in Figures 3 and 25; inflexible through the development they have been acquiring for twenty or thirty years, and whose too numerous arms spreading over such a large space necessitated the assistance of several men to throw them back on the neighboring *chaintre*. This originated the idea of forming the head with a single

stem about three feet from the ground, and giving a new direction to the vine branches. When we say *about three feet from the ground*, we mean about three feet from the base of the stock; this stock lies on the ground just the same. It is, therefore, not a matter of elevation above the ground, as many people think, and as is stated by some writers, but it is about three feet along the stock where the first cane, and not the first arm branches off, for there is only one arm or main stem. It is, therefore, an improvement on the original method, since the work is done better and more quickly. The English say that time is money; in culture, says Mr. Guyot, it is more than money; it is life itself.

In the case of *chaintres* with two arms, if the vines are planted on the edge of the field, as shown in Figure 26, the buds of each arm are suppressed as in *chaintres* with one arm, then they are bent down in such a way as to form the letter U; by this means the arms are more easily turned back on the row than if they were arranged in the form of the letter V, as has been done a few times. But, nevertheless, it is preferred to leave only one arm on the vines in the outside rows.

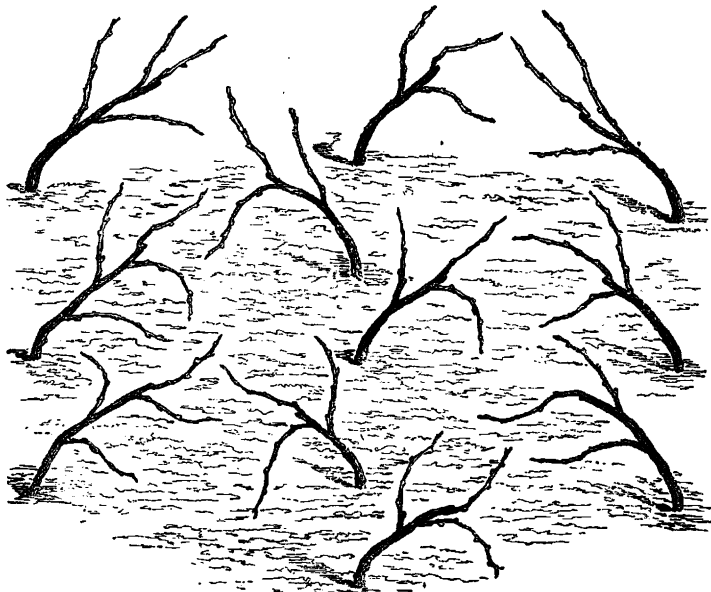
FIG. 26.

Three rows of *chaintres* having two arms.

Thus, in Figure 26, we would have to suppress, in the outer row on the left, the lower arm; and for outer row on the right, the upper arm. One essential thing should be spoken of here; that is that the first cane of every arm should always be on the left, and not on the right of this arm. There is a double motive for this practice, the importance of which can be fully estimated; first, in moving the long branches aside for plowing, there is no fear, as there is sometimes, of breaking them apart at the first fork; and in the second place, there is no danger of the plow cutting off the branches in passing along close to the row.

But if the vine row is between the two outside rows, one arm is bent down to the right and one to the left, after they have been disbudded according to custom.

FIG. 27.

Three rows of *chaintres* with one arm each.

In *chaintres* having but one arm, the latter is directed obliquely, as in the case of *chaintres* with two arms, but the branches of one vine extend to the right and those of its neighbor to the left of the row (Fig. 27).

We do not advise having only one arm to the *chaintre*, either when all of the arms are trained on the same side of the row, which has to be done sometimes, as, for example, in places where they have violent winds, or when trained as illustrated in Figure 27. Here is the reason: when the vine rows are about sixteen feet apart, the *chaintre* is too long, having to extend, owing to the obliquity, over a space about twenty feet wide. The ground around each vine is perfectly bare; hand labor is more difficult; the vine directed to the left is the wrong way of the plow; the furrow made by the plow in the middle of the space between the rows hinders putting in the fourchines, the earth not being dug up there; and it is absolutely necessary that the stem of a vigorous vine should be supported at its middle point; moreover, the furrow will give the vine a bad shape, and at that point it will be more easily disturbed by the wind.

None of these inconveniences exist when there are two arms cutting the row obliquely. For strangers who are not acquainted with our method, a vine with one arm offers greater attraction, more convenience in training. Thus it is that some vine-growers, even at Chissay, willingly adopt this method, which does not hinder their obtaining as large a vintage as with any other system.

We therefore prefer *chaintres* with two arms. Mr. Romuald Dejerrou, so competent in all touching the culture of *chaintres* in Algeria,

is entirely of our opinion: "If one of the arms is accidentally wounded or broken off, the production is not interrupted; fructification goes on until the lost arm is re-formed. Moreover, with two arms the forces are better distributed and more productive; the equilibrium is more perfect, and the sap does not all go to making wood, as sometimes happens in vines with but one arm."

But if one of these arms should acquire greater development than the other, it would be necessary, in order to equalize the vegetation of both arms, to summer prune the former now and then, allowing the latter to go on growing.

All these different methods of direction are of no little value in the cultivation of the vine. They have been tried with the view of simplifying culture and facilitating the hand labor accessory to the use of the plow, and permitting this implement to go close to the vines. Not only the primitive method, which allowed three or four arms to a *chaintre*, but the more recent one that gives only two arms, forming an angle of forty degrees with the vine row, assure as abundant a production as can be expected from the most boasted improvements made by our viticulturists.

Although, wherever vineyards are planted *en chaintres*, the same results are obtainable, there is still room for improvement, and we are sure that the intelligent men who have adopted this method will not come to a standstill in the road of progress they have entered upon.

CHAPTER X.

GENERAL AVERAGE PRODUCE.

Chissay possesses 900 hectares (about 2,250 acres) of vines on a very rolling site and offering every exposure to the vines; so that it was possible for this strange fantastic method of culture, as Doctor Guyot calls it, which we call culture *en chaintres*, to be practiced only on the plateau situated north of our town, and cut by the road from Romorantin to Amboise.

The soil of this commune is calcareous clay, and the vine roots penetrate a compact and impermeable subsoil (1).

The soil where these superb vintages are obtained, writes a visitor to our vineyards (2), is apparently very ordinary, and moreover, a large part of it, now covered with vine branches and fruit, was a few years ago, only waste land. The soil is silicious clay, more or less mixed with washed gravel. The parts called there by the name *perruches*, have a clayey subsoil, and are very damp in Winter. Their aspect is not at all inviting, especially after a Winter without frost, as that of 1875-1876, and a rainy Spring like that of 1878.

Therefore, this marvelous fertility does not depend very much upon the soil the *chaintres* grow in; it is proved that the production has been brought to its highest point by this extraordinary culture,

(1) The sandy clay soil, in which the vineyards *en chaintres* are situated, is good, it must be acknowledged; however, it would be only third rate land for wheat raising. Moreover, *chaintres* will thrive in ordinary or poor soil better than vines pruned short and restricted, as the vigor of the stock always gives corresponding vigor to the roots.—Dr. J. Guyot.

(2) Mr. A. Schmid, member of the *Société d'Agriculture d'Indre-et-Loire*.

and that this astonishing success is mostly due to the good method used.

Our best and richest vine-growers generally obtain half as much wine again from their vineyards *en chaintres* than from those planted in the ordinary way. We have often gone to consult some of them on the approach of the vintage, and then been able to ascertain for ourselves, by visiting their vineyards, that their enthusiasm when talking about the new method of culture was none too great.

We have seen the first vineyard planted *en chaintres* more than fifty years ago by the inventor of the method. This vineyard, the vines of which have been cut back and re-formed several times, is still very vigorous and fertile, which proves that this method of culture does not exhaust the vines, notwithstanding the abundance of fruit yielded by them. But Father Denis, who owned a great many small vineyards, and planted nearly all of them himself with the assistance of his son-in-law, could not pay them the attention they needed. However, this vineyard, about twelve square rods in extent, produced, in 1874, eleven barrels of wine of about sixty-six gallons each (measure of that country).

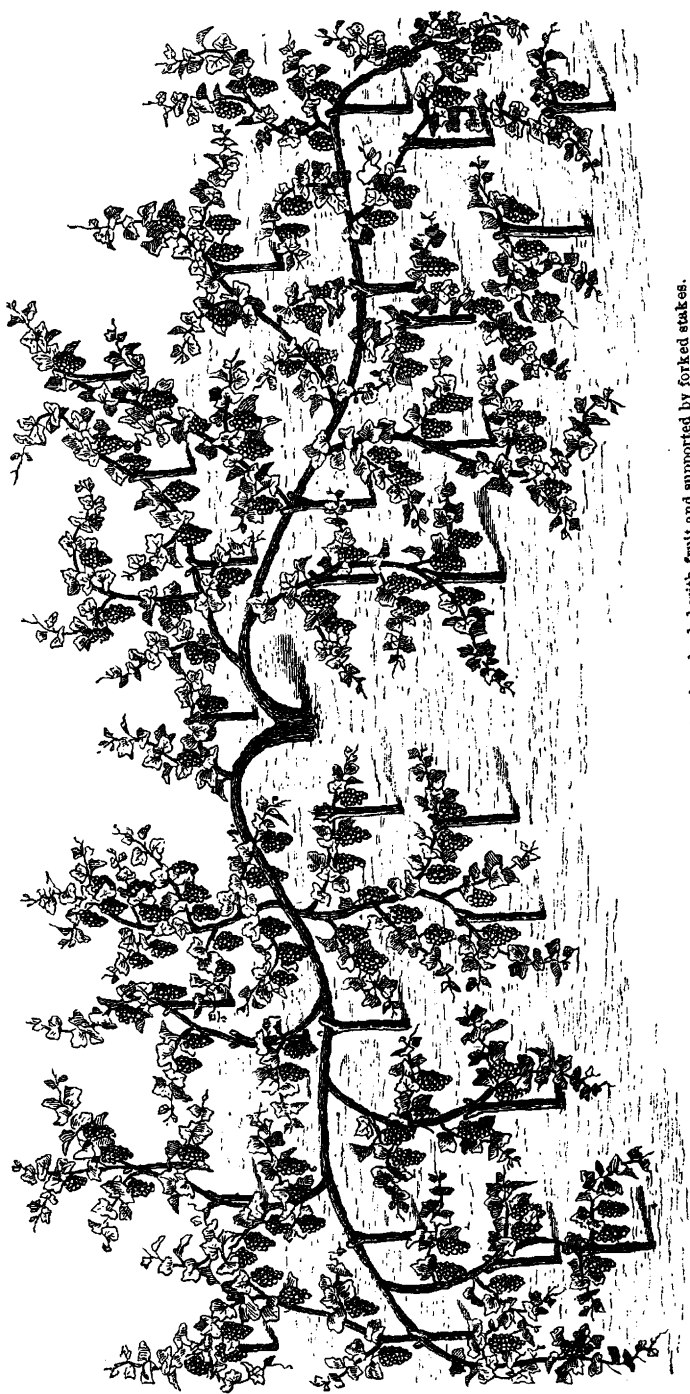
Count de Baillon, Mayor of Chissay, planted *en chaintres*, fourteen years ago, a piece of ground two hectares eighty-three ares (about seven acres) in extent. The rows are about twenty feet apart, and the vines in the row about six and a half feet from each other. The entire space between the rows is completely covered, and magnificent bunches of perfectly ripe grapes hang on the branches from end to end, even to their very tips. We measured one of these branches, taking the first one we came to, and counted the number of bunches hanging from a branch about six feet long; we found thirty. Figure 28 represents approximately a vine in this vineyard supported by *fourchîmes* at the time of maturity of the fruit. We say approximately, for it is difficult to portray on paper the development of the vine, the splendor of its vegetation, and especially of its fructification. This is assuredly one of the finest vineyards *en chaintres* in the commune of Chissay. In 1874 it produced 100 barrels of wine; in 1875, 120 barrels; in 1876, 60 barrels, notwithstanding the severe frost that Spring; and in 1877, 110 barrels. If the vines had been planted in the ordinary way instead of *en chaintres*, the expense of cultivating and keeping up the vineyard would now be ten times as great as that that has been involved in the culture of these *chaintres* since they were first planted.

The delegation of the central committee of phylloxera for the Department of Saône-et-Loire, in September, 1881, visited the vineyards *en chaintre* in the locality where the method was invented.

The reporter, Mr. Ch. Millot, speaks thus:

But the most wonderful vineyards of all are those belonging to Mr. Monpouet, situated on the plateau of the *Grange*. Mr. Monpouet is a viticulturist of great merit; he was awarded a medal at the Universal Exposition and at the district meeting of Tours; and surely, on visiting his vineyards we see that this honor was well merited.

FIG. 23.



Vine en chataînes with two arms, ten years after planting, loaded with fruit and supported by forked stakes.

There are several distinct plots, making in all not quite five and a half acres, of vines *en chaintres* (with two oblique arms), which yielded 175 hectolitres (about 3,850 gallons) to the hectare (about two and a half acres) in 1875, and which will yield 190 (about 4,180 gallons) this year. Such is the vineyard we went through, pausing at every step, and exhausting our vocabulary of admiration in presence of those robust vines, loaded with magnificent bunches of grapes. We counted forty-eight of these enormous bunches on a single branch, not quite three feet long, and there were sixteen of these branches on one vine.

Behold the result of Father Denis' idea put in practice by an intelligent vine-grower. With a piece of ground of ordinary fertility, and sold for twelve hundred francs per hectare when detached from the manorial estate of Chenonceaux, of which it formed a part, Mr. Monpouet made a splendid vineyard, now valued at ten thousand francs per hectare.

It is with regret that we leave this magnificent plateau, to visit still other vineyards *en chaintres*, equally as fine, and especially those of Mr. Rousseau, Mayor of Chenonceaux, and of Mr. Auger, Mayor of Chisseaux. After visiting the vineyards we have just mentioned, nothing can astonish us in the future, and the most abundant vintages will appear quite ordinary to us.

We have endeavored to state, without any exaggeration, the admirable results obtained from culture *en chaintres* in Chissay and the neighboring villages. They are known facts there, and so well known, that people come from all parts of France to visit the vineyards of Chissay; and that, as a general thing, the visitors depart with the firm intention of finding out if this method of culture, which succeeds so well in Touraine, would not be equally advantageous in other places. To speak the truth, we do not see anything to hinder it.

At a time when vineyards have to be renovated to an unfortunately great extent, it is well to call the attention of the vine-growers to the method of culture adopted in Chissay, and to the results obtained from it.

Tetu-Coursault owns in the midst of the vineyards of Chissay between one and one and a half acres of *chaintres* planted at the usual distance from each other; that is to say there are about twenty feet between the rows and about six and one half feet between the vines in the row. In 1877 he obtained about thirty barrels of wine from this well arranged and well kept vineyard. But what we most admired in it was a vine of the folle blanche variety, whose arms, about thirty-five feet long, had eighty-six fruit canes and covered about seven hundred and ninety square yards of ground. This vigorous vine alone produces a half barrel of wine, that is about thirty-three gallons; we see that it is remarkably adapted to this generous pruning.

Mr. Jousset, from about an acre and a half of vines planted *en chaintres* in the commune of Saint Georges, which is next to ours, obtained, in 1873, thirty-seven casks of about sixty-six gallons each. It must be said that this vineyard had been extensively fertilized, that the soil of Saint Georges is more suitable for vine culture than that of Chissay, and that the average amount obtained from one *arpent* (from one to one and one half acres) is from twenty-five to thirty barrels in vineyards planted *en chaintres*, and from twelve to fifteen in ordinary vineyards.

Mr. Lebariller, of Luzillé (Indre-et-Loire), owner of the Rassay estate, has planted about eighty acres of vines *en chaintres*. We have been told that these vines, in 1874, yielded a magnificent vintage, and gave promise of producing 1,000 barrels of wine. But we know that this able and zealous viticulturist has been known to make his vines produce 970 barrels of sixty-six gallons each in a country where the vines planted in the ordinary way produce only twelve barrels to the hectare. Since that time, this model vineyard has been kept up and has produced 1,100 barrels of wine.

We have seen many other vineyards loaded in a greater or less proportion, and a great many vine-growers, all of whom proclaim loudly the excellence of their method of culture; those we have mentioned will be sufficient. We have spoken of these particular ones so as to give an idea of the general average vintage from typical vines, and in order that, if it should be necessary, information

may be obtained from the very place that gave birth to this progressive culture.

Thus, according to the preceding, the produce of vineyards, per hectare, may be reckoned as follows:

Ordinary vineyards.....	12 barrels.
Vineyards en <i>chaintres</i>	30 barrels.

The average production has risen in the last ten years through increased energy and improvement in the culture of the vine.

We must give here one of the principal objections brought to bear upon those who extol the *chaintres* method.

The wine obtained in these vineyards, it is urged, is and must be inferior in quality to that obtained in other vineyards, for a vine which bears too largely cannot give good fruit, and the grapes growing on the extremities of the arms of the *chaintre* cannot ripen as well, nor have the same quality as those nearer the stock. This is an erroneous assertion, which experience has contradicted, and which interest alone has pushed forward.

The lamented Doctor Jules Guyot took upon himself to answer this assertion. In 1860 he wrote:

For twenty years arboriculturists have extended their beautiful science to the production of the grape, and not one of them would hesitate to allow any vine to bear all the fruit that its development and vigor would admit of. Arboriculturists, therefore, understand perfectly that it is possible to reconcile, to a certain degree, the quantity and quality of the grape. If the vine-grower is not up to the mark in this respect, it is because he has not had the benefit of information, meetings, and public encouragement.

The vine-growers of Chissay have not marched along in the old routine. They understand that the vine should grow at liberty, and acquire vigor and extent, in order to yield good fruit; and they now offer to vine-growing countries a new method of cultivating the vine, which will be adopted in many places as soon as it is made known. The celebrated doctor says elsewhere:

Certain varieties demand long pruning, in order to prove remunerative; but, as is easily understood, long pruning does not diminish the quality of the fruit, as it does in the case of varieties that produce on short spurs; thus the vines of the Medoc, Bourgueil, Champigny, and Saint-Émilion, when pruned long, like the Breton or Carbenet-Sauvignon, do well. The wines of the banks of the Rhone are produced by long pruning, such as is used for the Serine, Vionnier, etc. On the other hand the inconveniences of long pruning are all avoided by a wise suppression of superabundance, and by properly pinching off the extremities of the fruit branches. Therefore every vine must be treated intelligently, in order to insure the quantity and quality of produce desired for market and for profit. Every vine that bears too much fruit does not produce good wine, that is true; but every vine that does not bear the quantity of fruit proportionate to its vigor and development produces as good wine with long pruning as with short. This is proved absolutely in the case of the Saint-Émilion, Medoc, Jurançon, Côtes-Rôties, etc.

The doctor says he has often seen the long wood of the first year prove a failure, and be incapable of ripening the fruit; but this is due to the disproportion of the roots formed by and for the benefit of the stock, and does not occur the next year, when the extension of the stock has created proportional roots.

Let us add, regarding our own vines, that proof is also to be found here. The wine of the Chissay is always highly esteemed and much sought after in commerce, and the principal cause of this superiority is the fact of the grapes being so near to the ground at the time of their maturity.

They are beginning to use this method of culture in Algeria. If it is, in fact, a country where *chaintres* can develop most easily, and give the best results, the triple ear of corn is indeed emblematical of it. The vegetative vigor of the vine is, so to say, extraordinary in that warm country. A great many canes of the current year attain a length of about ten to thirteen feet, and when four years old, at the latest, the vineyard planted out with cuttings is in full bearing.

Our African colony may, therefore, like the vineyards on the borders of the Mediterranean, produce fine wines, and become a valuable resource for the parent State, a part of whose diseased vineyards are every year becoming more feeble and disappearing entirely.

The future welfare of this new France lies in the culture of the vine, and of the vine *en chaintres*. The Government would do well to propagate this method of culture, which has quantity, quality, and cheapness to recommend it. What more powerful means of colonization?

CHAPTER XI.

EXPENSE OF CULTURE.

In his report to the Minister of Agriculture on viticulture in the northwest of France, Doctor Jules Guyot expresses regret that he has not analyzed the work, nor studied the expense necessitated by this method of cultivating the vine; a method which must be easy and economical, since it is adopted by the small vine-growers, and imitated by the owners of large estates. Now, we give here, according to the authorities of Chissay, most competent in such matters, a detail of the costs of culture for the first ten years involved in the methods here in use, one being the method *en chaintres*, and the other the ordinary method.

Let us remark that by a custom that tends to be established here, selling the wine "naked," the expense of culture is materially diminished. The wine is sold for very nearly as much, the merchants putting but small value on the casks.

COSTS OF CULTURE OF ONE HECTARE PLANTED EN CHAINTRES.

Distance between the rows.....	20 feet.
Distance between the vines.....	6½ feet.
Number of vines to the hectare.....	800

First Year—Expenses.

	fr.	c.
Cultivation of soil before and after plantation.....	75	00
Eight hundred rooted vines, two years old, at 5 francs per hundred.....	40	00
Plantation, at 0 francs .05 per vine.....	40	00
Harrowing.....	5	00
Fertilizing, 300 kil. of guano.....	96	00
Sowing, 18 décalitres of wheat.....	45	00
Marrage(1), three operations.....	30	00
Total.....	331	00

Produce.

	fr.	c.
Twenty hectolitres of wheat, at 20 francs.....	400	00

(1) *Marrage* is the operation that consists in putting clods of earth on the extremities of the branches to hold them down to the ground.

Second Year—Expenses.

	fr.	c.
Cultivation	27	00
Pruning	3	00
Eighteen <i>décalitres</i> of oats, for sowing	19	80
<i>Marrage</i> (three operations a year)	30	00
Total	79	80

Produce.

	fr.	c.
Twenty <i>hectolitres</i> of oats, at 7 francs 50	150	00

Third Year—Expenses.

	fr.	c.
Cultivation	27	00
Pruning	5	00
Forty-eight <i>décalitres</i> of potatoes, to plant	42	00
<i>Marrage</i>	30	00
Total	104	00

Produce.

	fr.	c.
Seventy <i>hectolitres</i> of potatoes, at 3 francs	210	00

Fourth Year—Expenses.

	fr.	c.
Cultivation	27	00
Pruning	15	00
<i>Marrage</i>	30	00
Two thousand four hundred forked stakes, at 0 francs 60 per hundred	14	40
Putting in stakes	3	00
Cost of vintaging for seven barrels, at 6 francs per barrel	42	00
Seven casks, at 10 francs	70	00
Total	201	40

Produce.

	fr.	c.
Seven barrels, at 70 francs	490	00

Fifth Year—Expenses.

	fr.	c.
Cultivation	27	00
Pruning	25	00
<i>Marrage</i>	30	00
Five thousand forked stakes	30	00
Putting in stakes	3	00
Wages of women moving aside and replacing the arms of the <i>chaintres</i>	8	00
Costs of vintage for fifteen barrels, at 6 francs	90	00
Fifteen casks, at 10 francs	150	00
Fertilizing one half the hectare	200	00
Total	563	00

Produce.

	fr.	c.
Fifteen barrels, at 70 francs	1,050	00

Sixth Year—Expenses.

	fr.	c.
Cultivation and pruning	57	00
<i>Marrage</i>	39	00
Putting in forked stakes	5	00
Wages of women for moving aside and replacing the arms of the <i>chaintres</i>	8	00
One thousand stakes	6	00
Costs of vintage for twenty barrels	120	00
Twenty casks	200	00
Fertilizing the other half of the hectare	200	00
Total	626	00

Produce.

	fr.	c.
Twenty barrels, at 70 francs.....	1,400	00

Seventh Year—Expenses.

	fr.	c.
Cultivation, pruning, and <i>marrage</i>	87	00
Placing the stakes.....	5	00
Moving aside and replacing the arms of the <i>chaintres</i> for plowing.....	10	00
One thousand stakes.....	6	00
Costs of vintage for twenty-five barrels.....	150	00
Twenty-five casks, at 10 francs.....	250	00
Total.....	508	00

Produce.

	fr.	c.
Twenty-five barrels, at 70 francs.....	1,750	00

Eighth Year—Expenses.

	fr.	c.
Cultivation, pruning, and <i>marrage</i>	92	00
Placing the stakes under the vines.....	8	00
Moving aside and replacing the arms of the <i>chaintres</i> for plowing.....	10	00
Two thousand stakes.....	12	00
Costs of vintage for thirty barrels.....	180	00
Thirty casks, at 10 francs.....	300	00
Total.....	602	00

Produce.

	fr.	c.
Thirty barrels, at 70 francs.....	2,100	00

Ninth Year—Expenses.

	fr.	c.
Cultivation, pruning, and <i>marrage</i>	97	00
Placing the stakes under the vines.....	10	00
Moving aside and replacing the arms of the <i>chaintres</i>	10	00
Five thousand stakes.....	30	00
Costs of vintage for thirty barrels.....	180	00
Thirty casks.....	300	00
Total.....	627	00

Produce.

	fr.	c.
Thirty barrels, at 70 francs.....	2,100	00

Tenth Year—Expenses.

	fr.	c.
Cultivation, pruning, and <i>marrage</i>	97	00
Placing the stakes under the vines.....	10	00
Moving aside and replacing the arms of the <i>chaintres</i>	10	00
Three thousand stakes.....	18	00
Costs of vintage for thirty barrels.....	180	00
Thirty casks, at 10 francs.....	300	00
Total.....	615	00

Produce.

	fr.	c.
Thirty barrels, at 70 francs.....	2,100	00

	fr.	c.
Expenses for 10 years.....	4,927	20—
Receipts.....	11,750	00—
Profits of 10 years.....	6,822	80—

\$985 44

2,350 00

1,364 56

COSTS OF CULTURE OF ONE HECTARE PLANTED IN THE ORDINARY WAY.

Distance between the vines in the rows.....	4½ feet.
Distance between the rows.....	4½ feet.
Number of vines to the hectare.....	5,600

First Year—Expenses.

	fr.	c.
Plantation.....	245	00
Five thousand six hundred rooted vines.....	350	00
Fertilizing.....	80	00
Cultivation.....	125	00
Total.....	800	00

Second Year—Expenses.

	fr.	c.
Cultivation.....	125	00

Third Year—Expenses.

	fr.	c.
Cultivation.....	125	00

Fourth Year—Expenses.

	fr.	c.
Cultivation.....	125	00
Five thousand six hundred stakes.....	33	60
Tying and stripping the leaves off the vines.....	12	00
Costs of vintage.....	18	00
Three casks at 10 francs.....	30	00
Total.....	218	60

Produce.

	fr.	c.
Three barrels, at 70 francs.....	210	00

Fifth Year—Expenses.

	fr.	c.
Cultivation.....	125	00
Seven thousand stakes.....	42	00
Tying the vines.....	12	00
Fertilizing.....	1,000	00
Costs of vintage.....	48	00
Eight casks.....	80	00
Total.....	1,307	00

Produce.

	fr.	c.
Eight barrels, at 70 francs.....	560	00

Sixth Year—Expenses.

	fr.	c.
Cultivation.....	125	00
Tying up the vines.....	8	00
Costs of vintage.....	60	00
Ten casks.....	100	00
Total.....	293	00

Produce.

	fr.	c.
Ten barrels, at 70 francs.....	700	00

Seventh Year—Expenses.

	fr.	c.
Cultivation.....	125	00
One thousand five hundred stakes.....	9	00
Tying up the vines.....	9	00
Costs of vintage.....	60	00
Ten casks.....	100	00
Total.....	303	00

THE CHAINTRE SYSTEM OF

<i>Produce.</i>		fr.	c.
Ten barrels, at 70 francs		700	00
<i>Eighth Year—Expenses.</i>		fr.	c.
Cultivation		125	00
Six hundred stakes		3	60
Tying up the vines		10	00
Costs of vintage		72	00
Twelve casks		120	00
Total		330	60
<i>Produce.</i>		fr.	c.
Twelve barrels, at 70 francs		840	00
<i>Ninth Year—Expenses.</i>		fr.	c.
Cultivation		125	00
Two thousand stakes		12	00
Tying up the vines		12	00
Costs of vintage		90	00
Fifteen casks		150	00
Total		389	00
<i>Produce.</i>		fr.	c.
Fifteen barrels, at 70 francs		1,050	00
<i>Tenth Year—Expenses.</i>		fr.	c.
Cultivation		125	00
One thousand stakes		6	00
Tying up the vines		12	00
Costs of vintage		90	00
Fifteen casks		150	00
Total		383	00
<i>Produce.</i>		fr.	c.
Fifteen barrels, at 70 francs		1,050	00
Total expense for ten years		4,274	\$854 80
Receipts		5,110	1,102 00

Thus we see that the expense involved in the culture of vines *en chaintres* amounts, in ten years, to \$854 80, while by the other method it amounts to \$985 44. But by the first a profit of \$1,364 56 is obtained, and by the second \$247 20.

The following comparative table will set forth the difference existing between the two methods of culture one year with another:

COSTS OF CULTURE OF ONE HECTARE PLANTED EN CHAINTRE.

	fr.	c.
Twice cultivating, pruning, and <i>marrage</i>	90	00
Twice placing the forked stakes and stripping off some of the leaves	20	00
Wages of the women who move aside and replace the arms of the <i>chaintre</i> before and after plowing	8	00
Taking care of and renewing the stakes	12	00
Costs of vintage for thirty barrels, at 6 francs	180	00
Thirty casks, at 10 francs	300	00
Fertilizing, 400 francs every six years, amounting, for one year, to	66	66
Expenses	676	66
Receipts	2,100	00
Net profit	1,423	34

COSTS OF CULTURE OF ONE HECTARE PLANTED IN THE ORDINARY WAY.

	fr.	c.
Pruning and <i>marriage</i>	125	00
Twice tying up the vines and stripping off some of the leaves.....	20	00
Taking care of and renewing the stakes.....	12	00
Costs of vintage for fifteen barrels.....	90	00
Fifteen casks, at 10 francs.....	150	00
Fertilizing, which is done every six years, amounting, in that time, to 1,080 francs, for one year costing.....	180	00
Expenses.....	577	00
Receipts.....	1,050	00
Net profit.....	473	00

There is but little difference, we see, in the expense of culture according to the two methods; but the profit obtained by the new method, which is always the end to be considered, exceeds that obtained by the old, by 950 francs (about \$190). However, we must add that in reality the costs of culture *en chaintres* are much less than we have represented them here. For all owners of vineyards, large or small, own at least one horse, to be used in the work of cultivating the soil. Now, as to this matter, it is evident that the work done by the horse should not be estimated as so much expense to the vine-grower, who uses the same horse for his viticultural labor that he uses in the fields. One principle, however, we admit, and it resolves itself into an axiom, that is: to have vines, you must have horses. Thus, although according to the figures we have given, the costs of culture seem to be nearly the same in the two methods, it is no less true, that, in practice, there is quite a material difference; for the vine-grower will plow his *chaintres*, or have them plowed, at little expense, and hand labor, which considerably augments the costs of culture, will be thereby very much diminished. Moreover, he knows that he will have a remunerative vintage, which is the aim of all his efforts, while giving his vine vitality and exceptional fertility.

Culture of the vine by the old method in fact involves an expense of hand labor that is ever tending to increase; whereas, by the new method, it is materially reduced, and the profits enlarged. There can no longer be any hesitation as to which method to choose.

CHAPTER XII.

CHARENTRES AND PHYLLOXERA.

In presence of the scourge that is ravaging the vineyards of France to a great extent, many motives, which we consider as indisputable, should actuate the viticulturists of the devastated regions to reconstitute their vineyards by adopting our method of planting their vines far apart.

Says Mr. Pellicot, the learned President of the agricultural *comice* of the district of Toulon:

It is proved by experience that whatever increases the vigor of the vine also increases its power of resistance in its terrible struggle with phylloxera; on the other hand, if insecticide must be resorted to in order to defend it, it will be easier and much more economical to treat only 800 vines to the hectare instead of from 6,000 to 10,000.

The vigilant owner of a vineyard, in which the vines are planted far apart, by a carefully, and in fine weather every now and then examining the vines that seen

least vigorous, can always assure himself of the presence or the absence of the insect, and, consequently, attack it on its first appearance; then the treatment would be confined to a limited space about the foot of the vine.

Moreover, American vines, either when planted for the sake of the fruit, or when used for grafting stocks, must be planted far apart in order to maintain their normal qualities and their force of production; planting them close together may one day lessen their power of resistance, as in their native country they require liberty and space.

Therefore vines must be planted far apart, and what method will you adopt in order to obtain the greatest possible production with a small number of vines? Why waste the years in experimenting and groping about when other viticulturists have, in the past forty years, experimented with, created, and perfected a method of culture wherein the vines are planted at great distance from each other.

Mr. Pellicot writes further: "My *chaintres* are planted in the midst of phylloxerated vineyards almost entirely destroyed, and they do not seem to show any signs of the insect."

We are convinced that this method of culture is capable of resisting the attacks of phylloxera for a much longer time than the usual method.

We know that the phylloxera abandons the roots when it no longer finds sufficient nourishment there. We also know how very vigorous the vine is, and how energetically it defends itself against anything that injures it, against whatever stands in the way of its development. Well, then, with culture *en chaintres*, as soon as the ravaging insect leaves the roots blighted by its bite, the vine throws its force to these abandoned parts, and gives them a vitality that will defy the attacks of the insect. (R. Dejernon, *notes sur la vigne en chaintres*.)

We have before us, regarding the guarantees it would be possible for culture *en chaintres* to offer against the attacks of phylloxera, a series of notes which we consider would be of interest reproduced here:

If phylloxera invades Touraine, writes Mr. Louis Hervé, it will be curious to note the resistance offered it by the vineyards cultivated *en chaintres*. In fact, in the canton of Montrichard, between Blois and Tours, this ingenious method of culture has been in vogue for forty years. Every vine covers an extent of ten square metres (about twelve square yards), and the development of its roots has an equal extent under ground. It is quite presumable that a vegetation, so extensive and so vigorous, would at least be as resistant to phylloxera as the American varieties most renowned on this account. In the south, some viticulturists endeavor to protect themselves from the ravages of phylloxera by a method of culture *en hautains*, allowing the vines to grow high, which, like the method *en chaintres*, gives the vine great vigor and great extent of roots. I have always thought that that was the best antidote for the scourge. In fact, pruning the vine short is contrary to nature. This incessant mutilation of the vine, whose nature it is to spread indefinitely, weakens its vigor considerably; consequently we must not be astonished to see it succumb to the attacks of an insect. I hope that some method of culture which will allow this precious plant more scope, will fortify its constitution sufficiently to render the attacks harmless, or at least prevent their being mortal.

Such has been the idea, moreover, of many viticulturists of the south. A vine-grower of Vaucluse has just published a pamphlet wherein he relates his success with his vineyards cultivated *en hautains*.

This experiment, in my opinion, is much more preferable to the method that consists in replacing our French varieties by American vines that are not so good. A little reflection would convince one that if the American varieties are robust, it is because they are not subjected to the degenerating treatment of short pruning and mutilation generally used in French viticulture.

Mr. Félicien Viel, Mayor of Puygiron (Drôme), wrote to us in 1877:

I must tell you that the ravages of phylloxera have been so great that we have scarcely anything left of our old vineyard, which occupied one half of the cultivated land. Our vines trained on trellises have alone resisted them. Is that due to their being higher than our ordinary vines? Is it because, standing alone, or at least at great distances from each other, the roots have acquired greater development, and hence more vigor? I know nothing about it, but the fact is certain. Since then we can hardly place hope in any method but the culture of vines on trellises; but it is expensive, and not easy to carry out, owing to the high winds we frequently have in our regions. Hence your system might be the proper solution of the problem.

An able viticulturist of the Lower Pyrenees, Abbot Frandin, congratulates Mr. Denis for having introduced the method of culture *en chaintres*, with long canes. It is true progress. "The phylloxera, which threatens us," he adds, "will force the vine-grower to adopt this method of culture. It is only the well rooted vines that will resist the pest, and in order that vines develop good roots, they must be pruned long, and be far apart from one another."

Mr. E. Rouyer, Engineer of Arts and Manufactures at Saintes, gives us the following testimony: "I fully agree with you as to the interest presented by the modification of vine culture, called culture of vines *en chaintres*, in connection with the struggle against phylloxera."

Mr. Correnson, honorary member of the Court of Appeal of Nimes, wrote, January 2, 1877:

The phylloxera has not yet reached you, but if fate thrusts upon your vineyards this countless, unparalleled, invisible mass of microscopic insects, you will soon find out that the vines planted at such a distance apart as to prevent their roots interlacing, will better resist the attacks of the insect, which will soon destroy those that are planted closer together. In the department of the Gard, in the canton of Roquemaure, commune of Tavel, where my vineyard of forty hectares (about 100 acres) has been completely destroyed by the pest, we have noticed that the vines in the outside rows were often the only ones that were resistant and escaped destruction; everywhere else the vines were attacked by these terrible insects. We have also remarked, in the commune of Pujaut, our unfortunate neighbor and the first to be attacked, in 1862, I think, in the quarter of Étang, where the boundary line of nearly all the little vineyards consists of a row of vines, that the latter also is attacked by the insect, but most of these vines prove resistant and are the only ones that produce the small quantity of wine that is obtained from Pujaut.

How are these facts, the results of observation, to be accounted for, unless it is that the roots of these vines are out of reach of those that are attacked and infested? The conclusion to be drawn from these facts should induce us to adopt, in the reconstitution of our vineyards, a method of culture, wherein the roots of the several vines will be as far apart as possible, in order to derive the greatest advantage from the vines. The method of culture *en chaintres* seems to me to satisfy most of these requirements.

Mr. Victor Rendu, in his *Ampélographie Française*, shows that the more the vine develops, as it does in its natural state, the more fertile it is in fruit and the more vigorous its wood; and the longer it lives, the more fertilization and care it needs. "The vine," says he, "in its natural state, un mutilated by art and not subjected to its caprices, is endowed with extraordinary vigor and powers of duration; it is less liable to be affected by inclemencies of the weather or by diseases. When the stunted vines, twisted and deformed by pruning, are reduced to the state of a vegetable skeleton, and it is only with great difficulty that the sap can pass through the obstructed and obliterated canals, the vine has indeed become decrepit, and the hour of its death is at hand."

Then, too, the *Moniteur Vinicole* of December 26, 1877, published an interesting article on this subject, from which we extract the following:

What is the influence of this method of culture, considered as a means of defending the vine from the attacks of phylloxera? This is the last point and not the least important one remaining to be studied.

The vine was made to cover completely, with its magnificent foliage, a mass of rocks, almost an entire hill. There are few plants in the vegetable kingdom endowed with more vigor and ranker growth, that need greater space, in which to spread out powerful arms, innumerable and fertile branches. And what has civilization done for it? The superb giant has become a deformed and stunted dwarf; such mutilation certainly could not be conceived were it not brought about little by little, imperceptibly as it were.

Is it astonishing, after all this, that the vine lacks vigor and rankness of growth, its exhaustion is followed by disease, that it can no longer resist the attacks of its ene

Assuredly not; on the contrary, one thing alone should surprise us and excite our admiration, and that is that the vine has not yet been killed with all our butchery.

There is hardly any doubt, I believe (moreover the much greater resistance of vines trained on trellises and allowed considerable extent, is an established fact that proves it), that, if the vine was allowed to branch out as in its natural and primitive state, it would very soon recover the vigor and rankness of growth necessary to enable it to triumph over the attacks of its enemies, and principally, of its parasites. This return of the vine to its natural condition is not possible in the present conditions of agriculture and economy; it would be useless even to think of it. But what is possible, and should be tried, is to bring the diseased vine at least under better conditions, that it may acquire vigor and health. Some intelligent viticulturists have recommended this for several years past, relying on the principle given in the first part of this article. The vigor, longevity, and fertility of the vine increase in direct proportion to the extent of its development.

Is not that as much as to say that training the vine *en chaintres*, whereby its development is greatly increased, will augment to a like degree its powers of resistance to phylloxera?

Try planting and cultivating the vine *en chaintres*, in the very heart of phylloxerated countries. Give it as much space as possible, but double the number of vines when the pest has disappeared. Try, poor viticulturists whose vineyards adjoin those that are attacked, or whose vines are in the first stage of the disease—try taking up five plants out of every six, or nine out of ten, and excite their arborescence by this means and by good fertilizers.

May this method therefore be adopted in newly planted vineyards, and before long we shall see a new era of prosperity opened to France, whose vineyards are now so ravaged by phylloxera.

Let us hope, indeed, that science will succeed in ridding us of this new enemy of the vine, which threatens to ruin one of the chief sources of wealth of our country. However that may be, in this new method of culture, the number of vines being sufficiently limited, it will be easier to combat the invasion of phylloxera.

The vineyard *en chaintres* can certainly be defended and preserved by the use of insecticides better than the others.

In Limay (Seine-et-Oise) there is a mine, owned by Mr. Simon, of sulphureted pyrites, a fertilizer which, when applied to phylloxerated vineyards, produces shoots from six to ten feet long. We, ourselves, have had the opportunity of seeing canes of that length cut in a vineyard in the south, that was attacked by phylloxera and treated with the mineral matter obtained from the mine of Limay. If the vineyard, when thus fertilized, can produce vigorous shoots and fine grapes, its preservation, says Mr. Millot, becomes simply a question of money.

CONCLUSION.

Is it not the aim of all intelligent viticulturists to increase the production of the vineyard while decreasing the expense?

We know that the price of hand labor in vineyard work has come to be exorbitant, and it is that fact that has induced a search for means of simplifying it, and has instigated the invention of the method *en chaintres*. Wherever it can be used, the plow now takes the place of the pick; staking, always hard work, is excluded with us, and experience has proved how much the production of our vines can be increased by training them according to the method *en chaintres*.

Complaint is made that the increase of agricultural labor and production demands more hand work than hitherto, and that men are scarcer. The problem, at present, is to remedy this evil. As far as we are concerned, the problem is solved: our method is a direct remedy for this state of affairs. Moreover, we have no fear of emigration. Our working men are attached to their native soil, and can earn more here, without leaving the paternal roof, than by working in the cities.

Let it suffice, therefore, to sum up the reasons that are in favor of our method of vine culture:

1. This method, requiring infinitely less hand labor than the old, favors the extension of viticulture.

2. The expense of stakes, iron wire, and paling is avoided.

3. To complete the economy of this method, the fruit, fertilizers, and composts do not have to be carried on the back for any great distance, the wagons being able to pass anywhere in the vineyard.

4. The development allowed the *chaintre* lessens the danger of *coulure*, and protects it, in great measure, from the injurious effects of Spring frosts.

5. Canes near the ground are very seldom attacked by *oidium*; the *côts* trained *en chaintres* here have never been attacked by this disease.

6. The production is doubled, and, while waiting for it, the vine-grower is somewhat compensated by intercalary culture.

7. Let us add that this method has received the sanction of experience, and the approbation of the greatest names, and of those of the most authority in viticulture.

8. Finally, it is a practical means of defense against phylloxera.

It, therefore, lies with intelligent vine-growers to choose between the usual methods so contrary to their interests, and the rational method, the adoption of which will increase the profits obtained by their labor.

THE CHAINTRE SYSTEM. (1)

Improvements Suggested by Armand Cazenave, of Bordeaux.

[MISS ANNA LOUISE WETMORE, Translator.]

CHAPTER IX.

THE CHAINTRE METHOD OF PRUNING. (2)

Forty years ago a new method of viticulture, called culture *en chaintres*, was introduced in Chissay, commune of Loir-et-Cher, on the road between Tours and Vierzon.

The ever increasing price of hand labor was the principal cause of it. Its inventor, Denis Lusseaudeau, having inherited a small estate, concluded that the best thing for him to do was to plant it in vines; but instead of setting them out a metre's distance—that is a little over three feet—apart in every direction, according to the custom of the country, he planted his rows about forty feet apart, so as to cultivate cereals in the intervening space.

Later, his vines becoming vigorous, he pruned them in long branches, intending, when his cereals were harvested, to extend these branches in the spaces, then free, between the rows.

The magnificent results obtained induced others to imitate him; his method was soon adopted in the country round about Chissay.

* * * * *

[Cazenave here quotes Dr. Guyot, as has been done already by Vias.—Translator.]

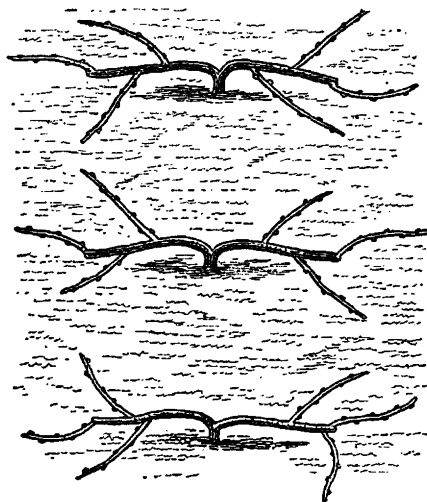
In these interesting pages, while giving an idea of the *chaintre* system, Dr. Guyot does not enter into the technical details, and we are convinced that it would be difficult for a viticulturist, after having read them, to come to any reasonable conclusion. We are going to supply them, giving our readers the benefit of the observations made by us on the premises themselves.

As we said before, Denis Lusseaudeau cultivated cereals between his vine rows. People were not long in seeing that the vine culture alone, without this mixture, was very much preferable, and adopted the distance of twenty feet between the rows and six and a half feet between the vines in the rows. Hence there is a surface of about 130 square feet for each vine at the adult age, that is, about seven or eight years, to cover completely.

(1) This chapter is taken from the *Manuel Pratique de la Culture de la Vigne dans la Gironde*, by Armand Cazenave, Propriétaire de la Réole (Gironde.) I have prepared for publication a translation of each chapter of this Manual relating to pruning, but decided to separate this part so that it might be studied in connection with the work of M. Vias. However, the reader should carefully study Cazenave's explanation of the cordon system before assuming to understand this chapter in all respects.—TRANSLATOR.

(2) According to Dr. Jules Guyot, *chaintres* signify trailing chains.

FIG. 84.

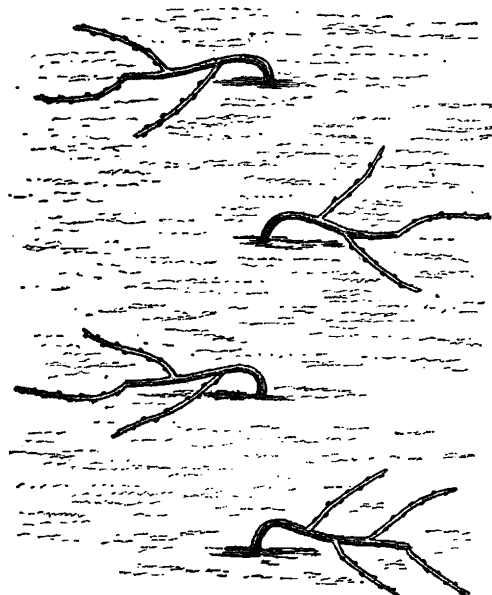


The large space of twenty feet left between the rows, and which we shall call a check, is cultivated with the plow; this work is in the alternate checks, since, to plow one check, it must be cleared of all the vines covering it, the latter being moved back on the neighboring check. The plowing done, every vine is put back in place, and checks that were omitted are then plowed in their turn. When plowing is all over with, the branches are arranged as regularly as possible, and that portion of the ground in the vine rows which could not be touched by the plow is cultivated with the spade.

It is easily comprehended that, intelligently applied, the *chaintre* method must bring about excellent results. We are able to verify this. It produces abundantly, as its pruning is long in every sense of the word. It is a means of obtaining quality, since the grapes being near the ground ripen more regularly and earlier. It is economical, for it requires neither high stakes nor iron wire, and lessens the amount of hand labor. These are the essential qualities in agriculture: good crops, good quality, and economy in labor.

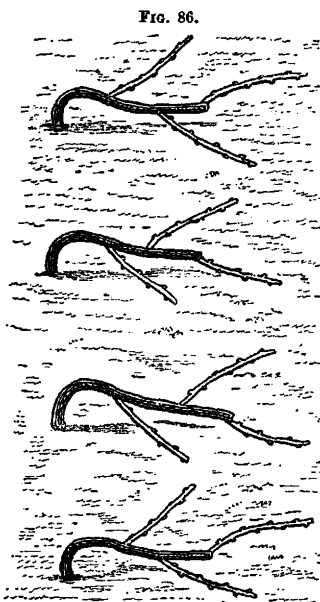
However, it may be said that even in the country where it was invented, the method *en chaintres* is applied at random. Some vine-growers branch their vines close to the ground into two arms, which they direct one to the right and one to the left of the row (Fig. 84); others, to have a more uniform distribution of the sap, have only one arm to each vine, and these arms are

FIG. 85.



directed alternately to the right and the left of the row (Fig. 85); still others have one arm on each vine, and extend them all on the same side of the row (Fig. 86).

Opinions differ also as



to the proper length to be given to each cane in pruning. Some think that it should not exceed one metre; others maintain, on the contrary, that they should not be shortened in, even if they are three metres long. We, ourselves, have seen a great many canes more than eight feet long, which seemed an exorbitant length to us, but did not at all dismay the vine-growers. If there is a large space to cover, they allow the cane to grow to its full length, without troubling themselves as to the equilibrium of the vine; if the space is limited, on the contrary, they shorten in the canes when pruning.

For several years past the *chaintres* method has been in progress of perfection. Most vine-growers, having recognized the difficulty of maintaining the equilibrium of the sap with two arms, prune all their vines to one arm; they also found that, in order to turn their vines back without injury, it was indispensable to cause the main stem of the vine at the trunk to bend over

in the form of a swan's neck, and to keep it free from any shoots or branches a distance of two and a half to about three feet from the trunk. Then, too, experience proved that the vine should be trained up as soon as its canes permit of so doing, and that it is well to tie it up to a stake during the first few years. This is an excellent practice and should be universally followed. The advantage derived therefrom would amply compensate for a slight increase of expense and labor.

At Chissay, during the first years, the vine is pruned as close as possible to the ground. After the second pruning, executed on two eyes, each vine is provided with a stake, on which the two or three shoots that are developed are carefully trained.

At the next pruning, which is the third, only one cane, the straightest and best situated, is left on the vine, and this is cut to a length of from five to six and a half feet, according to the vigor of the subject. All the eyes on this cane are suppressed from the ground to a height of about three feet; and during the Summer all developments of buds or suckers on this part of the main stem are rubbed off. If the vine is subjected to Spring frosts, the cane is kept attached, in an upright position, to the stake, until the danger is over; but at this epoch the stake is removed, and the extremity of the cane is allowed to rest on the ground, taking care that it forms at its base,



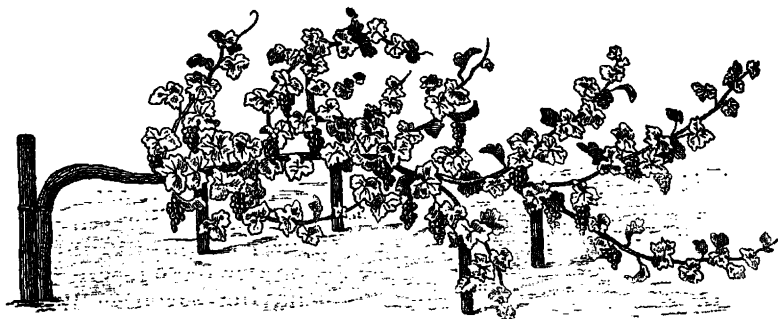
at the point A, a swan's neck, as seen in Figure 87. If the vine does not assume this shape of itself, a little stake about twenty inches high is put at its foot to compel it to form the curve.

The swan's neck is not made use of in Chissay, but we have seen it applied on a large scale in a vineyard in the commune of Angé,

where we were able to verify its great advantages in assuring to the vines the necessary suppleness for frequent displacement.

We must not lose sight of the fact that it is indispensable to adapt the shape of the vine to the space to be occupied, for every time the ground is plowed, the whole vine must be turned back on the neighboring check to be restored to its place when cultivation is over. The turning about of three gigantic vines may appear difficult to one who has never seen it done; in practice, nothing can be easier.

FIG. 88.



The young vines, pruned as we have just described, about the end of July have the aspect of Figure 88. At this epoch, after the last plowing, the vines being put back in place, are upheld by forked stakes, so that the fruit will not come in contact with the ground. These forked stakes are about one and a half feet high, and consist either of branches naturally forked at their extremity (A, Fig. 89), or of any sort of wood notched on the top with a gouge (B, Fig. 89).

FIG. 89.

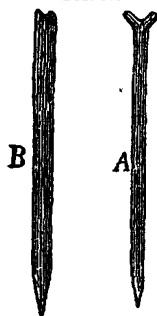
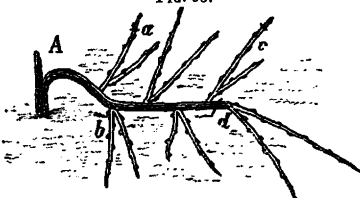


Figure 90 shows us a vine in the Autumn of the fourth year. When it is time for it to be pruned, it

will be capable of bearing three branches, from two to three feet long, according to its vigor; they will be formed by the canes *a*, *b*, and *c*; all the other canes will be cut off close to the old wood,

FIG. 90.

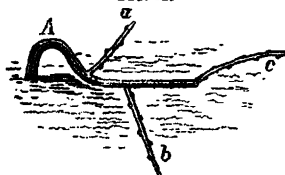


and the extremity of the vine will be cut off at the point *d*. Figure 91 shows us this same vine after pruning, with its three branches (*a*, *b*, and *c*,) extended over the ground.

Each of these canes will put forth from eight to twelve shoots, as

seen in Figures 91 and 92. In the Spring, all the shoots developed on the old wood, especially those at the base of the vine, up to the first branching, are rubbed off; only those in good situation for the establishment of a branch, as *i* (Figure 92), are reserved.

FIG. 91.



This figure (92) represents a vine in the fifth year, ready for pruning. Then a fork is established on the branch *B* of the preceding year, formed by the two new shoots, *a* and *b*; another fork is established on the branch *c*, formed with the shoots *c*, *d*; on the branch *D* three canes, *f*, *g*, *h*, are left. A spur of two eyes, called a *poussier*, in the *chaintres* country, is left at the point *i*.

FIG. 92.

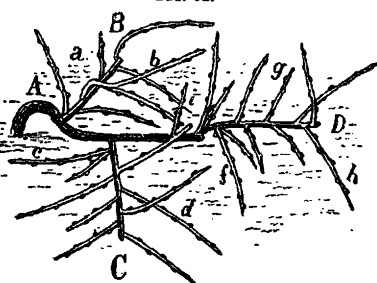


FIG. 93.

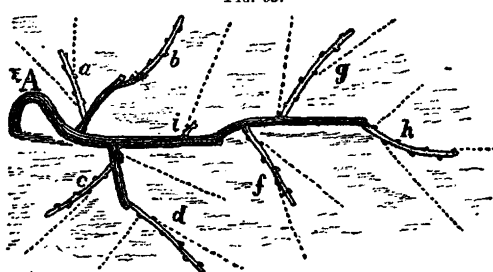


Figure 93 represents a vine after the fifth pruning, the one we have just described, having seven fruit canes, *a*, *b*, *c*, *d*, *f*, *g*, *h*, and a *poussier* *i*. The dotted lines in same figure indicate the number and place of the shoots that will be left on this vine the following year, if its vigor permits. After the sixth pruning on, the

vines begin to cover the space devoted to them; it is not until the eighth or ninth year that they attain their full length.

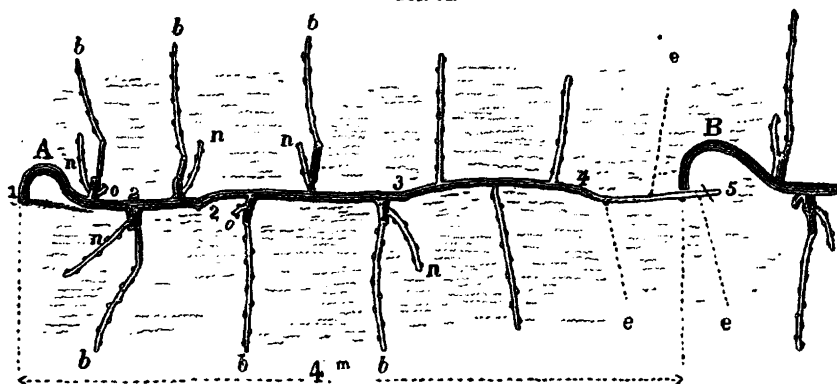
Any experienced person will understand that the form we have just described is easily executed and maintained; it appears to us one of the best calculated to cover the ground to be occupied by the vine.

We noticed at Mr. Arthur Johnston's vineyard, Mesnes, a form which also pleased us by its simplicity, and which we cannot but recommend; we give a representation of it in Figure 94. The main stem forming the cordon, has, throughout its entire length, arms usually consisting of a cane, *b*, of ten or twelve buds, a *poussier*, *n*, of from three to six buds, and sometimes of a *côt*, *o*, of one or two eyes; these arms are situated on the right and left of the main branch, there being a space of about two feet between those on the same side. It has taken four years for the formation of the main stem: the first year it grew from the point 1 to 2, and had three arms; the second year, from 2 to 3, having three arms more; the third year, from 3 to 4, and again three arms were added, and finally the fourth year, the branch was prolonged from the point 4 to 5. The vine rows in this plantation being a little over thirteen feet apart, the fifth year the framework of the vines is entirely formed; the dotted lines, *e*, indicate the places of the three arms that will be left on the branch to complete its framework.

The description just given and the accompanying figures were taken from vines that appeared to us to have the most perfect forms. Putting together the good points we have gathered up here and there,

we wished to enable our reader, who would like to try this method of pruning, to do so under excellent conditions.

FIG. 94.



Like all human inventions, the *chaintre* method of culture may be improved upon. We shall give our ideas on this subject.

Experience has convinced us that in viticulture a person should seek out the simplest and easiest methods. This idea induced us to adopt the form of a single cordon having thereon arms symmetrically disposed, such as are used in the methods adopted in bottom lands. This idea also led to our preference, in the *chaintre* method, of the form used by Mr. Arthur Johnston, consisting of one arm. (Fig. 94.)

In order to derive all the advantage possible from the *chaintre* method, such a form must be chosen for the framework of the vines as will enable them to cover all the ground devoted to them, and insure a proper distribution of the fruit, neither too crowded nor too far apart, on the canes that will be developed.

Figure 95 represents our ideal; it is readily seen that it is the application of our unilateral cordon to the ground, with a few modifications in pruning and in the space allowed between the arms.

FIG. 95.



As in the *chaintre* method, the vine must first be pruned close to the ground; when it is old enough to be made to assume its regular form, it is pruned to a single cane, which is topped to four fifths of its height; the eyes and shoots of this cane will be rubbed off at the proper time from the collar of the roots up to a height of about three feet; all the shoots, too, on the side opposite that on which the arms are to be left must be rubbed off; it would be well, also, to thin them out if they are too thick on the side where the arms are to be,

so that they will develop uniformly. It would be very advantageous to fasten this stem to a horizontal slat, so as to have the cordons as straight as possible; and we must see that the vine assumes the shape of a swan's neck at its base.

The first year the cordon is established the vines must be inspected frequently, so as to pinch the too vigorous shoots and maintain uniformity in the vegetation. We refer the inexperienced reader to our directions concerning the treatment of the cordon the first year. (1) However, we will state that the shoot at the extremity best suited for the prolongation of the cordon, must not be pinched.

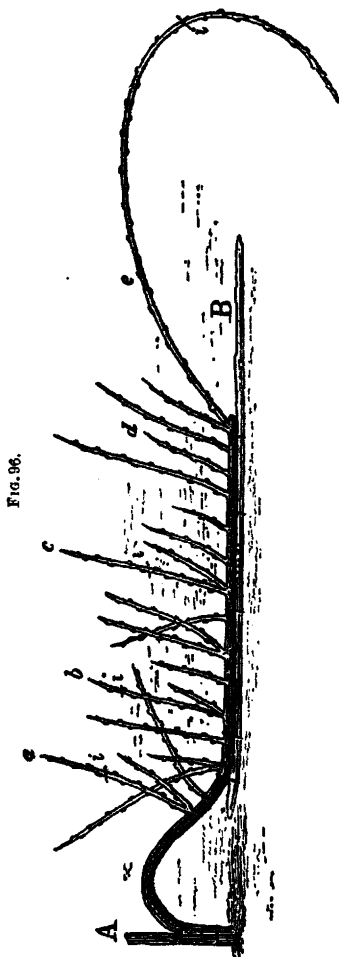


FIG. 96.

In the Autumn, the vine will have the aspect of Figure 96; the swan's neck will be kept in shape by the little stake *A*; the cordon will be very straight, owing to its being trained on the slat *B*; in consequence of the pinching, the shoots will have developed uniformly, as in the case of our young cordons, and the prolongation of the branch will not be wanting.

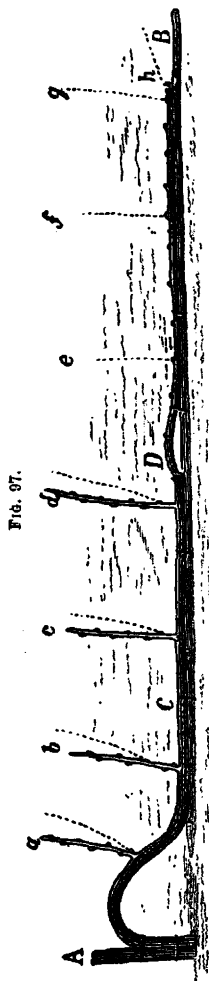
(1) The reader will find the principle of the cordon discussed in Cazenave's *Manuel*, to be published as an Appendix to this report.

To prune this vine, the shoots *a*, *b*, and *c*, will be topped at *i*; the cane *d* will not be touched; the prolongation *e* topped at *i*, and all the other shoots suppressed. After being pruned and trained, the vine will have the aspect of Figure 97, which, as you see, has four canes of nine or ten buds, and one about five feet long, prolonging the cordon.

The little stake *A* will not be dispensed with until there is no longer any danger of the swan's neck losing its shape. The stem, or cordon, *C*, will be kept straight by means of the slat *B*; especial care must be paid to its treatment at the base of the prolongation *D*.

The next year three new branches will be installed as indicated by the dotted lines *e*, *f*, *g*. The prolongation *h* will be developed and reach the neighboring cordon; it will be carefully trained on the slat as recommended for Figure 97. The arms *a*, *b*, *c*, *d*, will be pruned to a single cane developed at their base, having the same number of buds as the canes *e*, *f*, *g*. The whole number of buds must be proportioned to the vigor of the subject.

The following year the cordon will be complete, and have a number of arms in proportion to its length.



Until the cordon is provided with arms throughout its entire length, the most vigorous shoots of the arms already established must be pinched close to the last bunch of grapes; the vegetation of the prolongation must be kept uniform, in the way we described for the first year the cordons are established. We must not forget to rid the prolongation of all the shoots on the side on which there are to be no arms.

The year following, when the cordon has all its arms, the vegetation might be left to itself, without pinching, unless too much difference is manifested in the vigor, which, we are certain, happens very seldom; in such a case, a certain number of shoots on the too vigorous canes would be pinched.

We consider it best, in the case of *cordon chaintres*, to have the rows from thirteen to sixteen feet apart, and about eight feet between the vines in the rows, in good soil; for poorer soil, the distance in the rows might be lessened to about six and one half feet.

We do not believe that there would be any advantage gained by increasing the space between the vines. In the *chaintre* country we saw that most of the vines were planted about twenty feet apart; in many cases, the vines could hardly cover this space; we may add that there are many spots that are never covered, for at the age of eight or ten years the vine has attained its full development; it maintains its state, but the vine-grower is absolutely master of its vegetation.

The distance between the arms on these cordons should be from twenty to twenty-four inches, say seven or eight arms to a length of about thirteen feet.

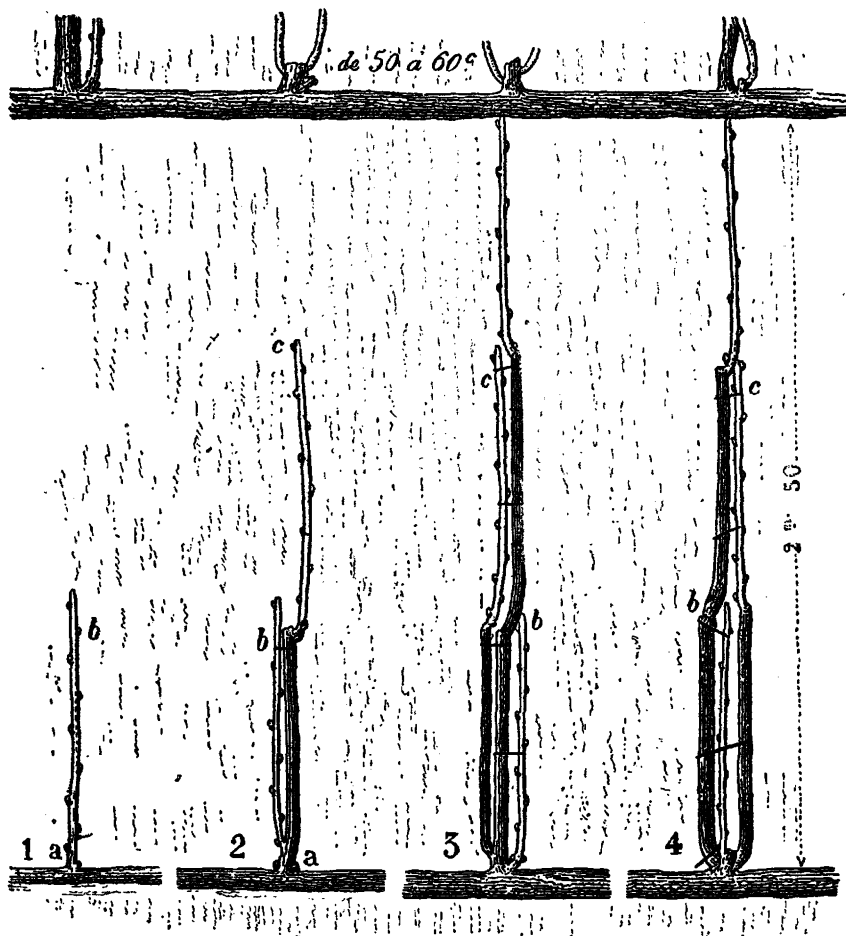
Every perfect arm, such as is represented in Fig. 95, should have three canes. The distance between the *chaintres* being from about six and one half to eight feet, according as the vines are planted; each cane, consequently, will have an average length of from two to two and one third feet; say about twelve or fifteen very fruitful buds to the cane. If you consider that every vine has seven or eight arms of three canes each, you can understand the enormous production that can be obtained with this method.

The arms should be pruned in such a manner that their canes will cover properly the space between the *chaintres*, or rather the cordons, like the arms 3 and 4 in Figure 98. Arm No. 1 of this same figure is only one year old; the shoots that will come from the buds *a* and *b* will form the two canes of arm No. 2, two years old; the shoots that will come from the eyes *a*, *b*, and *c* of this arm, will constitute the three canes of arm No. 3; finally, the following year, the branch having the top cane will be cut at the first forking point; a cane taken at the base of the arm will furnish the lower branch; the bud *b* will produce the middle cane, and the bud *c* the top one. These canes are represented on arm No. 4. The next year the branch of this arm bearing the top cane will also be amputated at its base; one of the shoots at the extremity of the middle branch will form the top cane; one at the extremity of the lower branch will constitute the middle cane, and the one best situated at the base of the arm will form the lower branch.

The difficulty in this method of pruning will be to obtain the necessary wood for the lower branch; hence, in ridding the vines of suckers, you must not neglect to leave some to develop at the base of the arms, in order to have a *côt* or *poussier* of two eyes on the one

best situated, so as thus to assure wood for this branch. It will always be an easy matter to procure the other two canes; they must be left, one on the top of the lowest branch and the other at the extremity of the middle branch, points towards which the sap always flows in preference, and where one may be sure of finding choice canes.

FIG. 98.



Every year the branch bearing the top cane must be amputated as close as possible, while sparing the others.

We consider that this form of the *chaintre* method we have just described presents great advantages. We intend to try it. It is regular and mathematical, and for that very reason, easy of execution if the rules we have laid down are carefully followed. The branches cover the space devoted to each vine perfectly, being neither too crowded nor too far apart.

The *cordon chaintre* method must offer still another advantage which we foresee, namely, that of enabling all the branches to be trained on slats, as shown by *a, b*. Fig. 95 gives an idea of what we mean.

This training on slats, which we recommend, is, it is true, an increase of labor and expense; it should be done in Winter, when hand labor is not so scarce. We should also remark that with vines trained in this manner the Summer cultivation will be rendered easier, for they can be moved about more rapidly; all the arms of a vine being fastened together thus, they can be moved about easily and without injury, by two experienced workmen.

The longest and most difficult part of the whole work, in the *chaintre* method, consists in putting the vines and their several branches back into place every time the soil is cultivated; it requires much attention, which can never be obtained from careless workmen. With the arms trained as we suggest, the work would be done much more quickly and every branch would always be in place. Moreover, in heavy wind storms the branches are sometimes blown about, occasioning a great deal of labor to replace them on the forked stakes. Then, too, when the *chaintres* are trained on slats, the quantity of forked sticks needed will be greatly decreased.

Ridding the vines of suckers is an operation that must not be neglected in the case of vines *en chaintres*; all those developed on the stock up to the first ramification must be removed. From this point on the superfluous ones should be suppressed, but it is impossible to designate them clearly. If the man doing this work is thoroughly acquainted with the method of pruning, he will know enough to suppress all the shoots on the old wood that will be useless for the next year's pruning.

In the *cordons chaintre* method (Fig. 95), one might conveniently remove all shoots developed on wood over one year old; the only ones not having to be removed would be those at the base of the arms that are in a suitable situation for the establishment of the *poussiers* we have spoken of, and which must serve as a foundation for the lower branches.

Pinching back (Summer pruning), is not practiced in Chissay. This operation would be of advantage for the vigorous shoots at the extremity of the full grown branches, such as *b, b, b*, in Fig. 94. In the case of *cordons chaintres*, all the vigorous shoots of the top cane of each arm would have to be pinched. These shoots are useless for the next year's pruning, since the main branch itself, as well as the cane producing them, will have to be suppressed; moreover, these shoots, if allowed to develop vigorously, would injure the neighboring *chaintre* by becoming tangled in it.

The vines should be pinched about the end of May, before florescence, when the bunches of fruit are well indicated; the shoots we have designated are pinched close to the last cluster of flower buds, so as to permit their starting out anew with vigor, and which does not hinder their nourishing the fruit perfectly.

It is well known that *oidium* never attacks vines *en chaintres*; we shall not attempt to explain this phenomenon, but simply state the fact.

In localities subject to Spring frosts, the *cordons chaintre* method would offer another advantage. By stretching an iron wire about six and one half feet above the ground, along each row, the wire being supported by strong stakes, the arms could be suspended thereon after being pruned and attached to the slats. In this position the canes would suffer less from frost, and there would be no obstacle in the way of Spring cultivation.

It would be easy to try the *chaintre* method of pruning on old vines, without loss in the vintage, by preparing them for it one or two years in advance. To do so, it would be necessary, in removing the suckers in the Spring, to leave on every vine, as near as possible to the collar of the roots, one sucker, well situated, which would be trained in such a manner as to favor its vegetation. This would be pruned to two eyes, if its vigor or its union with the old vine was not all that could be desired; if vigorous, it would be pruned at a height of about five feet and treated the same as young *chaintres*. The old vines would be preserved this first year, but pinched rather severely to drive the sap to the shoot that is to form the *chaintre*. The old vines would serve as props to maintain the form of the swan's neck; they would be done away with the second or third year. Taking the precaution to dig the earth from around the foot of the vines, to force suckers to start below ground, the *chaintres* on old vines would have the aspect of young vines.

We would not recommend this *chaintre* method of culture for soil where the weeds grow very profusely, as in most of the bottom lands, but we are convinced that for most soils it would be advantageous and economical. It does not cost much to experiment with a few rows. To the incredulous, who might think that the *chaintres* exist solely in our imagination, we shall say: follow our example; go to Montrichard, on the road from Tours to Vierzon; visit not only Chissay, but its environs, on the right as well as the left of the Cher, where now, almost everywhere, vines are planted to be trained *en chaintres*.

SECOND ANNUAL REPORT
OF THE
CHIEF EXECUTIVE VITICULTURAL OFFICER
TO THE
BOARD OF STATE VITICULTURAL COMMISSIONERS,
FOR THE YEAR 1882-3.

OFFICE: 111 Leidesdorff Street, San Francisco, Cal.

APPENDIX II. Practical Manual of Pruning as Practiced near Bordeaux.



SACRAMENTO:
STATE OFFICE.....JAMES J. AYERS, SUPT. STATE PRINTING..
1883.

PREFACE.

As in my preface to Appendix I, I shall avoid discussing the merits of the various systems of pruning and training the vine, which are set forth in the following translation of certain chapters of the very valuable work of Mons. Armand Cazenave, a distinguished vine-grower near Bordeaux, France. Only Part II, relating to systems of pruning and training vines, has been translated. Chapter IX was published in Appendix I of this report.

The intelligent reader will take note of the differences of climate between the vine-growing sections of California and those near Bordeaux, and will no doubt perceive many modifications of the French systems, which might be applied here. The principles of pruning, as discussed by Mons. Cazenave, will be far more valuable to our vine-growers than the explanation of any new system. No intelligent man will fail to acquire advantage from this work; patiently studied by all our vine-growers, and its principles applied whenever practicable, it would be the means of adding annually millions of pounds to the grape crop of the State.

Again, I am indebted to my sister, Miss Anna Louise Wetmore, for painstaking efforts in translation.

CHAS. A. WETMORE,
Chief Executive Viticultural Officer.

SAN FRANCISCO, October 17, 1883.

PRACTICAL MANUAL

OF THE

CULTURE OF THE VINE IN THE GIRONDE.

By ARMAND CAZENAVE,

Proprietor at la Réole (Gironde), Member of the Society of Agriculture of the Gironde, and of the Commission
Créon and the Entre-Deux-Mers.

MISS ANNA LOUISE WETMORE, TRANSLATOR.

PART II—THE MANAGEMENT OF A VINEYARD.

CHAPTER I.

GENERAL PRINCIPLES OF PRUNING.

The aim of pruning vines is to promote their fructification, and, at the same time, to keep their vegetation within bounds. It varies according to the locality. The perfection of each method depends upon three fundamental things which the viticulturist must take into account; by these I mean: The form of the vine, the buds reserved for wood for future pruning, and the quantity of fruit the vine is to produce annually.

The *form of the vine* depends upon the method of pruning adopted. That the vine may have the desired shape, when pruning it, we must look ahead and reserve those eyes that, on developing, will furnish the canes necessary for the maintenance of this form.

The *reserve buds*, which are to furnish wood for future pruning, comprise the eyes, the *côts de retour*, which must be left in pruning, and the shoots that are well situated, and which must be spared when the vines are suckered.

The *quantity of fruit* the vine is to be allowed to bear depends upon the vigor and fertility of the vine. To determine it, the vine-grower must consider the pruning of the preceding year and the result obtained. He will see, from the number and size of the canes, whether the vine has increased or diminished in vigor; the fruit stems hanging on the canes will bear witness of its fertility. The amount will be augmented if the vine has acquired vigor, without yielding sufficient fruit. It will be diminished if, the production having been abundant, the vegetation is poor.

Whether the vines are old or young there need be no fear of allowing them to bear too much as long as they are vigorous, but they must be spared when the vegetation is poor or ordinary, which may be due to the quality of the soil, or the natural fertility of the variety.

Intelligently pruned, the vine, provided no accidents befall it, always maintains a regular form, whereas, if pruned regardless of rules, the vines do not preserve their uniformity for any length of time. It is therefore easy, in going through the different vineyards, to see where this operation is performed systematically.

The method of pruning varies in different circumstances. Each method has its own place where it is best executed; it loses its regularity the farther one goes from that particular locality.

In the Gironde there are four principal methods, namely:

First—Short pruning in goblet shape.

Second—The Saint Macaire method.

Third—Pruning to three *astes*.

Fourth—Low pruning.

The first of these methods should be used in the case of extremely fertile varieties, such as the *chasselas*, *enrageat*, or *folle blanche*, and the *jurançon blanc*, as well as some very productive red varieties.

The second and third, which favor fructification, must be used only in very fertile soils; bottom lands, good hillsides, or plains.

The fourth is used only in the Médoc.

I will describe these four methods as they are practiced in the localities where they are most systematically executed, and will state the means of perfecting them by remedying certain faults which I have noticed in them.

After having reviewed the diverse methods aforementioned, I will describe the method of pruning *à cordons*, which I have used in my vineyard of La Réole for the last twenty years. I invented this method myself, borrowing from the others that which appeared to me to be advantageous, with reference to culture as well as fructification.

I will also give Doctor Jules Guyot's method of pruning, a very simple method and easy of application, which would be advantageous in our department in soil of average fertility.

I will also say a few words on the culture of the vine *en chaintres*, which was invented about thirty-five years ago by a simple working man, Denis Lusseau, of the Commune of Chissay, near Montrichard (Loir-et-Cher). This method of culture, which would seem strange, not to say extravagant, to many vine-growers of our country, is however very rational. Intelligently applied, it would give splendid results in certain soils in the Gironde.

Those who would like to become thoroughly acquainted with this method, have only to address M. A. Vias, *instituteur à Chissay, par Montrichard (Loir-et-Cher)*, and ask for the pamphlet published by him describing this method. This pamphlet, with explanatory illustrations, costs 2 fr. 50 c. (about fifty cents).

It is not my intention to extol one method more than another. I shall endeavor to set forth the principles of each as clearly as possible, leaving to viticulturists to choose that which is best suited for them, with reference to the soil they have to deal with, as well as the aptitudes of the workmen employed.

One thing must not be lost sight of: as soon as the vine, recently planted, puts forth sufficient wood, the method of pruning to be adopted must be decided upon. Every delay in the normal constitution of the stock is a degradation of the vine and a postponement of remunerative production.

Not only is it necessary to train the vine in the first place in the shape it is to assume, but its frame must be complete without delay, in order to have well established vines, without deformity, and in which the sap circulates freely, and properly nourishes each short spur or each fruit branch.

Pruning may be done during repose of the vegetation, that is to say from the time all the leaves have fallen off until the sap begins to circulate, which is about the end of February. The vines must not be pruned, however, when the weather is too cold.

Whatever method of pruning is to be adopted, the treatment of the vine for the first two years is the same.

The vines being planted and earthed up, each plant must be cut down so as to leave only two eyes above ground.

These young vines, sometimes, put forth wood with vigor; very often, on the contrary, but very feeble shoots are developed the first

year. Figures 1, 2, 3, and 4 show how the vines look the first year just before pruning; Figure 1, rooted plant or cutting of exceptional prosperity; Figure 2, good result; Figure 3, very ordinary success; Figure 4, very feeble plant.

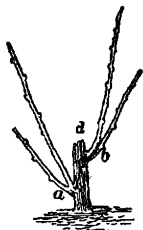


FIG. 1.

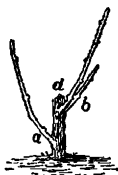


FIG. 2.

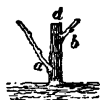


FIG. 3.



FIG. 4.

This first year, the lowest shoots, *a, a, a*, Figures 1, 2, and 3, must be pruned, leaving one or two eyes, and the others radically suppressed, while keeping the old wood. In the case of feeble vines, such as Figure 4, it suffices to cut off the upper shoots close to the old wood, without pruning the lowest one at all. The old wood, without being injurious, is useful to fasten the young shoots to, and prevents the vine from being covered up with the earth during plowing; it should not be cut off until the second pruning.

It would be well for all young vines, without excepting even the *enrageat*, to be provided with little stakes to keep them straight and well in line, until they are strong enough to dispense with a support. We are speaking here only of vines cultivated without high stakes, the others being obliged to have them at least after the second year.

The second pruning, being usually done with a view to preparing the vine for *anquage* the following year, will be described in speaking of the several methods. The word *anquage* is the term used in nearly all localities of the Gironde to designate the establishment of the forking point, or the beginning of the form of each method of pruning.

Many vine-growers have this forking point close to the ground, and then raise it, little by little, as the vine grows older, by suppressing the lower arms. A vine is like a fruit tree; it must, in its infancy, be trained in the shape it is to have thereafter. It is evident that if the forking point is close to the ground at first, to be raised later on, the wood that has to be pruned will be hard to cut, which is always injurious to the vine. This explains, too, the little uniformity there is in the shape of the vines in some vineyards.

All vines, pruned alike, necessarily have the same aspect, if they are of the same age and if the vineyard has been properly cared for. It is no more difficult to shape a vine on a given plan, than a tree; consequently all vines pruned according to the rules of a certain method, must resemble each other; if there are exceptions they are rare and nearly always due to accident.

In describing each method of pruning, I will mention the localities or vineyards that may be visited as types of each method.

CHAPTER II.

SHORT PRUNING IN GOBLET SHAPE.

Vineyards planted with *enrageat*, or *folle blanche*, or *jurançon blanc*, and in general any very productive red or white variety, should be pruned with short spurs of three eyes at the most. Nearly all the vineyards of white varieties in Fronsadais, Entre-deux-Mers, and Bénéauge, are pruned thus. In the communes of Saint Ciers d'Abzac and Maransin, Canton of Guitres, irreproachable types of this method may be seen; thousands of very old vines, pruned as regularly as in Figures 10 and 11, are to be found there.

As soon as the vines are vigorous enough to put forth shoots about three feet long, which is usually the second year, they must be pruned with an eye to the fact that, at the next pruning they will be made to assume their regular fork. In view of this, only the most suitable cane will be left on each vine, and this will be fastened vertically to a stake. (*a*, Fig. 5.)

This cane must be pruned so that the next to the top bud will be at the height at which the forking point is to be established; this must be about one foot above the average level of the ground.

Only the three upper eyes will be left on this cane; all the others are suppressed in pruning; when suckering those that may have been left are taken off. Figure 6 represents a vine of this age pruned and staked.

Every vine thus pruned will put forth two, three, and sometimes four shoots, which must be carefully fastened up. (See Fig. 7.) It is not rare to see fine grapes on vines of this age.

At the third pruning the young vines are made to assume their regular form; to do this, the two canes best situated to form an open V are cut back to two or three eyes, according to the vigor of the subject, and all the other canes are cut off. (See Fig. 8.)



FIG. 5.



FIG. 6.



FIG. 7.



FIG. 8.

In this method of pruning all the suckers on the old wood must be carefully removed—that is to say, all those below the wood pruned that year; this rids the vines of shoots, which being neither fruitful nor useful for future pruning, would occasion confusion in the vegetation of the current year. This operation is effected about the month of May, when all the shoots are well started; it is repeated in

June in young vineyards more subject than old ones to superabundant vegetation.

The fourth year, the vines generally put forth from five to eight shoots and should begin to bear well.

At the fourth pruning, if the vines are vigorous, each of the two spurs of the preceding year may be branched; there will then be four spurs of two or three eyes on each vine, as in Figure 9. Vines of ordinary or poor vegetation should be limited to two spurs pruned short, to reduce their production of fruit and augment their vigor. As the vine grows stronger and older, the number of spurs is increased by branching them.

It is hardly before twenty-five or thirty years that a vineyard, properly cared for, attains its perfect development. At this age, each vine should have, according to its vegetative vigor, six, eight, and sometimes ten well established branches, each surmounted by a spur of two eyes. (See Figs. 10 and 11.)



FIG. 9.

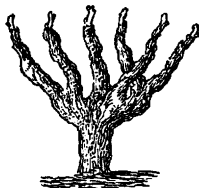


FIG. 10.

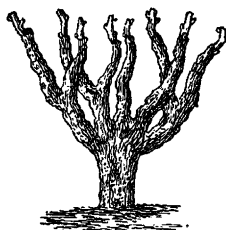


FIG. 11.

To facilitate cultivation, the vine should be kept in goblet shape broadened in the direction of the row. The arms of each vine should be at a good distance from each other in the circumference of the goblet and kept at the same height. Care must be taken to keep the equilibrium as perfect as possible in all the arms of a vine; for this it is simply necessary in pruning to leave less buds on the canes of the vigorous arms, and to pinch the shoots of these arms about the end of June, if necessary.

With this method, a careful vine-grower can prune his vineyard for thirty years without the aid of the saw. This instrument is useful only in exceptional cases; if a main branch is accidentally broken; after a frost or disastrous hail-storm; or when the vineyard, owing to its age, begins to decline, and it is best to moderate its vegetation.

Any viticulturist of experience must understand that by pruning the vines according to the rules we have just given, we can arrive at uniformity in shape throughout the vineyard, as well as perfect equilibrium in the arms of each vine. The sap being equally distributed, the production will be more abundant and of better quality.

I am convinced that the vineyards of Sauternes could be brought to perfection by similar pruning. The soil there is good, and the varieties quite fertile; the vines are all pruned with short wood, but unhappily without method and in a barbarous manner.

It is very much to be regretted that vineyards producing a wine so highly estimated are abandoned to the regular routine. In the large estates, in general, the vine is to the vigneron only a shrub, which

he trains in such manner as to make it produce as much wood as possible for fuel. One half of the profit of the wood belongs to him; all the arms which he cuts off, as well as the stumps which he grubs out, are his property; for every thousand cuttings he gets five francs if they are for the owner of the vineyard, and eight and even ten francs if sold to a stranger; his sole advantage depends upon the vigor of the vine. Little does he care whether the vine is fruitful, the vegetation uniform, or the stock high or low; if he can suppress an arm, replacing it by a branch or cane, it is seldom he does not do it to keep up his stock of wood.

I should add that the vine-grower has no intention or knowledge of doing wrong; he has always done this, and seen others do the same thing; he raises a stock to lower it later on, thinking to render it vigorous by this operation. He completely ignores the first principles of vegetable physiology, never having studied methodical pruning. As he makes the best white wine in the world, he would not easily submit to advice on this subject. The only thing that can be done is for an intelligent vine-grower to reform the pruning of this country by himself adopting a rational method.

CHAPTER III.

SAINT MACAIRE METHOD OF PRUNING.

It was with the Saint Macaire method of pruning that I began my viticultural career. To direct my first steps in its application I had an able vine-grower, who very soon initiated me in all the secrets of this method. It is advantageous, in certain respects, but it has its faults.

With this method the vines bear profusely; but, in an abundant year, the grapes are very much crowded at the extremity of the branch; they ripen badly, are inferior, and hence the quality of the grape suffers.

It is in the environs of Saint Macaire, and particularly in Saint Pierre d'Aurillac, that this method of pruning is practiced with the greatest perfection. Before *oidium* made its appearance the vineyards there were splendid; it was not rare, in abundant years, to obtain eighteen puncheons from one hectare.

The vines in this locality are cultivated *à joualles*, or else in single rows. By *à joualle* we mean, two rows from about two and two thirds to three and one third feet apart. The distance of one *joualle* from another is considerable when cereals are cultivated; it is about six and one half feet in vineyards where there is no intercalary culture. The single rows are far apart when anything is cultivated between them; they are generally about six and a half feet apart in vineyards planted solidly. The distance between the vines in the rows, in the case of *joualles*, as well as single rows, is always about three and a third feet.

The vines of Saint Macaire have two arms, which are trained, as far as possible, lengthwise, in the direction of the rows. The point where the two arms branch off is about one foot from the average level of the ground.

Before going further in the details of this method, I think it would

be well, in order that the reader may better comprehend them, to designate the different woods left in pruning, which are: the *tirette*, the *flage*, the *côt*, and the *retour* or *côt de retour*.

The *tirette* *c*, Figures 16, 18, and 20, is the fruit branch *par excellence*; it is allowed to grow to a length of from two and one third to four feet; the extremity is bent under, forming the curve *g*, Figures 16 and 20; or the twist *h*, Figure 18; upon it depends almost the entire production of the year.

The *flage* *b*, Figures 14 and 20, is a cane pruned from fourteen to twenty inches long, which, like the *tirette*, is bent over the stock near its base but whose extremity is not curved.

The *côt*, *e*, Figures 14, 16, 18, and 20, is a spur pruned short, so as to leave only two or three eyes at the most; the vine-grower depends upon this *côt* for the next year's *flage* or *tirette*.

The *retour* or *côt de retour*, *f*, Figures 18 and 20, is a small *côt* of one or two eyes at the most, pruned on a spur left on the old wood, either to be used in forming a new arm, or forming a new arm to take the place of one that has grown too long.

Vines of average vegetation usually bear a *côt* on one of the arms and a *tirette* of greater or less length on the other; those that are very vigorous at the adult age, that is to say at twelve or fifteen years, sometimes have a *tirette*, a *flage*, and a *côt*, as is represented in Figure 20.

Each vine is usually supported by two stakes, one placed at the foot to support it and form the curve of the *flage* or of the *tirette*; the other, a smaller one, is placed at a proper distance from the first to support the extremity of the *flage* or *tirette*; sometimes the vines have three props, as represented in Figure 20.

At the second or third pruning, if the vines have acquired sufficient vigor, they must be prepared for the form which they are to be made assume at the next pruning. For this purpose each vine will be pruned so as to leave but one cane, the one best suited to be attached vertically to a stake; it will be topped so that the second bud from the top, *b*, Figure 12, will be about one foot above the average level of the ground. Only the three upper buds, *a*, *b*, *c*, Figure 12, need be left on this cane.

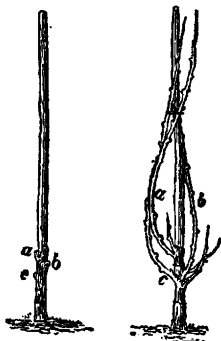


FIG. 12.

FIG. 13.

Each of these young vines will put forth, according to its vigor, two, three, or four shoots, which must be carefully fastened to the

stake as they develop. The result of the vegetation, by the end of Autumn, will be very nearly as represented in Figure 13.

At the next pruning we give the vine its regular form, leaving it after pruning a *côt* and a *flage*. The *côt* should always be left above the *flage*; hence, it is only after careful examination of the stock that the *côt* and *flage* should be chosen, taking care that the forking point will be at the desired height. If the *flage* (Fig. 13) was formed from the cane *b*, the *côt* would be made of the cane *a*; if, on the contrary, the cane *c* was better for the *flage*, the *côt* would then be formed of *b*, that is, just above the *flage*.

The length of the *flage* should be in proportion to the vigor of the subject; it must be bent over on the stake at the foot of the vine, forming at *d* a very regular curve, as is seen by Figure 14.

Figure 15 shows the vegetation of a vine after the fall of the leaves at the end of Autumn, the year it was first formed.

In poor soil, or that of ordinary fertility, the first years the vines are formed, only two *côts* are left on the young stocks. The intelligent vine-grower must never lose sight of the fact, that it is as important to be sparing with the poor vines as it is necessary to be generous with the vigorous ones.

We have already said that the *côt* should have only two eyes at the most. In the case of young vines of great vigor, sometimes three eyes are left. It is on the *côt* that the *flage* or *tirette* is to be found the following year; for this reason it is important that it should not be too long, in order that the shoots may be well nourished, and as near as possible to the crown of the old wood, so that the arms of the vine will not lengthen too quickly.

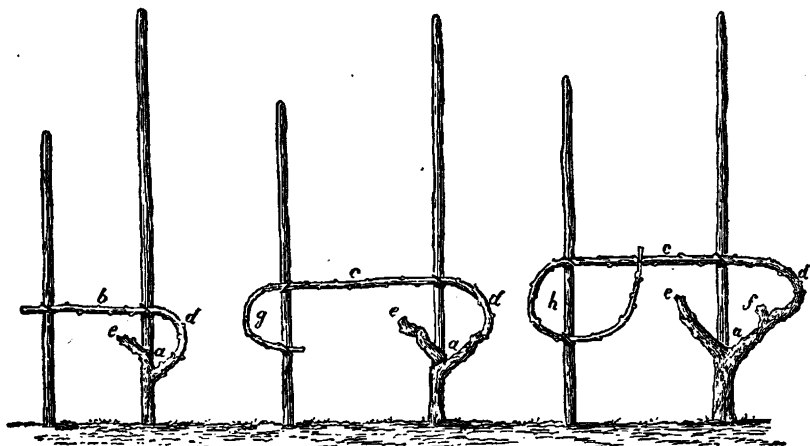


FIG. 14.

FIG. 15.

FIG. 16.

The *tirette* being the fruit branch, the production of the vine is regulated thereby. Its length must vary according to the vigor and fertility of the vine. Certain varieties cultivated in Saint Macaire do not bear without a very long *tirette*; others, on the contrary, such as the *grapput* or *bouchalès* would soon be weakened, and produce only inferior grapes with such pruning. It is especially in presence of such facts, that we comprehend the necessity of uniformity in the varieties that I recommended in the first part of this book.

The *flage* or *tirette* must be bent firmly, being brought over the stock and fastened to the stake (see *d*, Figs. 14, 16, and 18). This curve is for the purpose of hindering too great a circulation of the sap towards the extremity, and to induce the development of several rather vigorous shoots at the base of the *tirette* for establishing the *côt* at the next pruning. Without this precaution, if the curve was not drawn sharply enough, the sap would be carried in abundance towards the extremity of the fruit branch, the eyes at the base would prove abortive, or would be developed far from the old wood, and the arms would lengthen too rapidly, which would be very unfortunate.

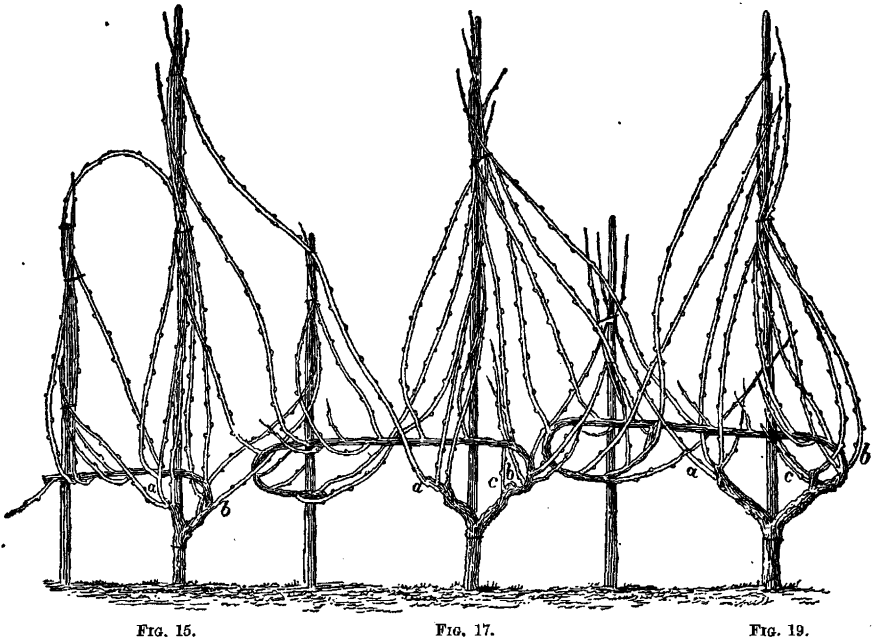


FIG. 15.

FIG. 17.

FIG. 19.

To assure the equilibrium of the vines, the *tirette* must every year be changed to the opposite arm. If always on the same side, this arm would become very strong, to the detriment of the other; the vegetation finally would be all on that side; the *côt*, being pruned short, does not lengthen the arm as does the *tirette*, so that if the latter was on the same arm for several years, there would be no uniformity in the height, a fault that must be avoided.

The *tirettes* of the same row should, as far as possible, be trained in the same direction, one year to the right, and the next to the left; thus the confusion arising from two fruit branches crossing each other on the same small stake is avoided.

These explanations given, we now come to the time of the fifth pruning; that is to say, that pruning following that whereby we gave the vine its regular shape.

To prune the vine (Fig. 15), as we have it, with its vegetation developed after the fourth pruning, we will choose on the *côt* the shoot most suitable for forming the *tirette*, say the shoot *a*, and at the base of the *flage* of the preceding years a cane suitable for the *côt*, say the cane *b*.

From this time on, the pruning by this method will be the same; a *côt* and a *tirette* to each vine, situated alternately one year on one arm, and the next on the other; such is the rule to be observed. It is also necessary to guard against lengthening the arms too rapidly, which is injurious to them. This will not happen, provided the shoots are not too numerous and the binding of the canes to the stakes is well executed, and the *flages* or *tirettes* curved as has been described.

At the age of eight years the well trained vine will appear as represented in Figures 16 and 17. One represents the vine after pruning and staking, the other shows it as it looks at the end of the next Autumn, before pruning. At the age of twelve years the vine will be at its prime. It will appear as shown in Figures 18 and 19.

About the age of twelve years, when the vines are in very fertile soil, it is well to add an extra arm so as to have two fruit branches on the same vine, a *flage* and a *tirette*, as is seen in Figure 20, always leaving a *côt* to assure the next year's pruning.

When the time for forming this new fork has come, in ridding the vine of shoots, a suitable one is left (*c*, Fig. 17), which is pruned back to one eye of the first year, and the second and third forms a *côt*. This *côt*, well constituted, will be able to support an *aste* or a *tirette*, as seen in Figure 20.

Vines properly cared for, according to this method, have a general uniform aspect. They begin to bear well by the fourth or fifth years. This production increases up to the age of twenty years, and is maintained for a very long time.

If the vines are not mutilated too much by being cut back they will live to be very old. When it is of advantage to shorten an arm it need not be cut nearer than eight or ten inches from the forking point.

In the culture of the vines at Saint Macaire the shoots are neither pinched nor Summer-pruned. They are allowed to grow luxuriously even to the top of the stake, which, I am sure, contributes to the vigor and health of the vineyard.

The removal of the suckers developed on the old wood—that is, from the ground up to the crown of the *côt*, *aste*, or *tirette*—is done very carefully, every one being suppressed. There is no exception to this rule, unless it is desired to form a new fork on one of the arms; then the work is done as has already been described.

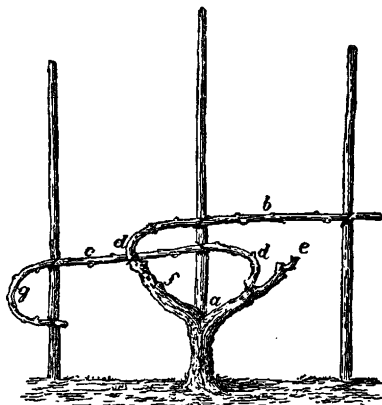


Fig. 20.

This method of pruning has been described as it is executed by the best practitioners; the explanations previously given, as well as the figures from 14 to 20, give an idea of the framework of the vines at different ages. It is important for the vines to form a straight wall along the rows, especially in plowed vineyards.

The vegetation of the vines pruned by this method remains to be considered. The *côts* (e, Figures 14, 16, 18, and 20) put forth from two to three vigorous and well constituted shoots. The one best situated must serve as the *aste* or *tirette*. However, it is well to observe that, of two shoots equally well situated, one of which is very vigorous and the other of average size, there should be no hesitation in choosing the latter, as it is more fruitful and easier to train.

If the *flages* (b, Figs. 14 and 20) and the *tirettes* (c, Figs. 16, 18, and 20) have been properly curved, they will always put forth near their base shoots of average size, but suitable for forming *côts*; on the curved part several vigorous shoots are always put forth; in the center, poor shoots, some of them abortive; finally, at the extremity of the *flages*, or on the twist of the *tirettes*, several shoots, the most vigorous of the vine, are developed.

On an average, on the *tirettes* of an adult vine of ordinary vigor, there are from twenty to twenty-two shoots, which develop more or less vigorously; and two on the *côt*—say about twenty-four to a vine.

One third of these form very vigorous canes; one third canes of average length; and the other third develop with difficulty, some of them after showing signs of development proving abortive. I must add that the most vigorous shoots, near the old wood, do not yield the finest grapes; they are found on those of ordinary vigor or those near the extremity of the *tirette*.

We have already stated that pinching is unknown in Saint Macaire, which is unfortunate, as it would be a very easy means of improving the equilibrium of the vegetation of a *tirette*. The vigorous shoots on this fruit branch are useless for the next pruning. By rigidly pinching those disposed to acquire great development, the force of the sap would be conveyed to the feeble buds as well as those tending to be abortive.

For several years past some vine-growers, to economize in the matter of stakes, have trained the canes on iron wire. The vine receives a little more air, but the *flages* and *tirettes* cannot be curved so well, and the shape of the vine suffers for that reason.

The principal varieties cultivated in Saint Macaire are: the *mancin*, *prueras*, *grapput* or *bouchalès*, *petite parde* or *pardotte*, *grosse parde* or *gros noir*, *panereuil* or *bois droit*, *piequpoul*, *vigney* or *merlot*, and the *queue rouge* or *malbec*. These varieties are for the most part very common and harsh, which, added to the nature of the fruit branch, whose extremity in abundant years is loaded with a crowded mass of grapes, affects the quality of the wines produced in these localities. The wines are known to be of very ordinary quality; they are firm, but when new, are harsh and very often greenish.

During the last twenty years better varieties have been selected; the quality of the wines from certain vineyards already bears evidence of this fact.

Throughout the country, cultivation of the soil is generally well understood and executed intelligently. The great majority of vine-growers, many of whom own their vineyards, understand the im-

portance of the young annual rootlets with reference to good maturity of the fruit. They are careful to induce their growth and development by Summer cultivation, given lightly and to the purpose. The rootlets developed above the collar of the roots are suppressed every year by the first cultivation, which is given in the month of April.

CHAPTER IV.

METHOD OF PRUNING ADOPTED IN BOTTOM LANDS.

This method of pruning, which gives the vine the shape of a cross, is generally adopted in all the bottom lands and islands of the Gironde. The localities where it is best executed are found on the banks of the Dordogne, from Acques to beyond Libourne. Very fine specimens of it are seen in the bottom lands of Campus, Nauze-grand, Arveyres, and Fronsac.

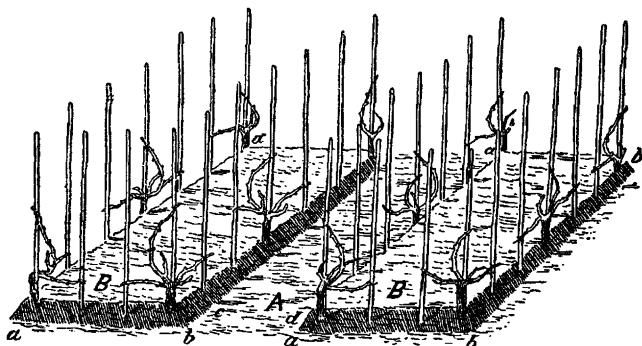


FIG. 21.

Vines in bottom lands are generally planted about six and a half feet apart in every direction. Formerly in such localities they were almost always cultivated with the *marre*, and planted out in checks. Figure 21 is a representation of this sort of culture. The lower part (A, Fig. 21), between the checks, is called the *reuille* or *rouille*; in many localities hay is grown there; sometimes wheat is cultivated on the high part (B), which is designated by the name *hautain* or *platain*; it is about ten or twelve inches above the level of the *reuille*.

Bottom-land vineyards are generally planted with rooted vines, care being taken that a part of the head of roots, called the *mère*, is inclined horizontally in the direction of the *platain*. (See Fig. 22.)



FIG. 22.

Before the use of iron wire each adult vine had three stakes; and, for at least two years, during the time of forming the forks, a small

supplementary stake was used that the center *aste* might be well supported. The stakes used in bottom lands are generally of chestnut or gem pine.

The terms used to designate the various parts of the vine in pruning are:

The *aste*: this is the main fruit branch, having on an average from six to eight buds; there are three to a vine; they are trained on stakes.

The *côt cabaley*: each *aste* generally has its *côt cabaley* from six to ten inches below it. It has from three to five buds, and is tied up to the *aste*, which it has to replace when the latter becomes too long.

The *œil* or *œil de retour* or *de rapprochement*; on it is established the *côt cabaley*, when the *aste* is too long and has to be suppressed. It is pruned so that it has but one or two eyes at the most.

An arm is made of the *aste*, with its accompanying *côt cabaley* and *œil de retour*, thus: (Fig. 31); *B*, right arm; *A*, left arm; and *C*, center arm.

There are two methods of forming the vines in bottom land vineyards. The *anguage, sur filleule*, an excellent modern method, and the ancient one, using the lateral shoots developed on a vertical cane prepared for this purpose the preceding year. We will describe the two methods, beginning with the first:

It is generally the second year, if the plantation is successful, that the vines are made ready for the form that will be given them later; only one shoot on each vine is allowed to develop, and this shoot is carefully fastened to a stake to prevent its being injured in any way. (Fig. 23.)



FIG. 23.

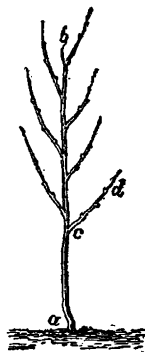


FIG. 24.

In the month of August, this shoot is topped at *c*, at a height of about five and one half feet. This operation causes the lateral eyes of this single stem to develop, as is seen in the young vine freed from its stake, represented by Figure 24; but the chief aim is to induce the development at the point where the fork is to be of a branch cane (*c*, *d*) sufficiently vigorous to constitute, with the main stem (*b*), the two lateral arms of the vine. All the eyes below the shoot must be radically suppressed. This shoot being the lowest, will have to be treated intelligently, in order that it may acquire the vigor necessary for it to form one of the arms.

Topping the main stem deserves some attention; it must be cut more or less short according to the vigor of the subject. In topping a vigorous subject too short, there is danger of inducing the development, not only of the shoots, but of the counter-shoots also; if on the contrary, a subject of ordinary vigor is not cut short enough, only the upper buds of the cane will develop, and the desired result is not obtained.

We recommend especially a method little used, but excellent, simple, and practical, by means of which we are sure of obtaining, with perfect success, a branch cane almost as vigorous as the main cane. It consists of bending the principal cane so that the shoot which is to form the branch cane is situated just at the point where the stem begins to bend; the latter is attached to a little stake placed at one side, and its extremity uplifted, as is seen in Figure 25.



Fig. 25.

This useful shoot, situated as it is on the curve, never fails to develop vigorously, whereas those above remain stationary to some extent. By using this method, the operation of topping the main stem loses its importance, and no longer needs to be calculated with such precision.

In this method of pruning the height of the forking point varies according to localities. It is generally established at about twenty or twenty-four inches above the ground. It would be necessary to raise it a little higher in vineyards subjected to the effects of Spring frosts.

The eye destined to furnish the branch cane necessary to form the fork, and which has just been spoken of, must be chosen by an expert and careful workman, who suppresses all the other buds from this point down to the ground. The bending of the canes which takes place either before or after this disbudding, requires a great deal of precaution. It is necessary to see that the eye in question is well on the curve, in order that the sap will be carried to it with more force.

In the Autumn following this operation the results obtained are those of Figure 24 or 25, according as to whether we have used the ordinary method or have adopted the modified one just explained. In pruning, in either case, the branch cane should be allowed such length as is necessary to enable it to be tied to the stake; leaving it, as is the case of the main cane, only two, three, or four buds at the most; the young vine thus pruned is then trained on three stakes, as shown in Figure 26.

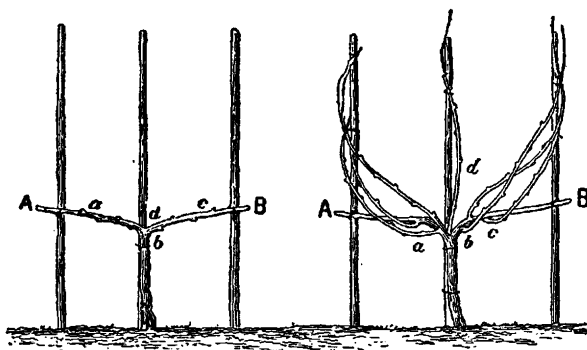


FIG. 26.

FIG. 27.

With this pruning and training, executed as we have just described, the result obtained should be as is represented in Figure 27, which portrays a vine in the Autumn of the fourth year, having three canes on each of the two parallel arms, and one cane developed from the eye situated at the axle of the two established *astes*. This cane (*d*, Fig. 27) serves to form the third or center arm.

When, in forming the fork of the vine the branch cane is found to be very feeble, it is pruned so as to leave only two or three eyes, as represented in Figure 28, taking care to fasten a little above the *côt* (*c*) a simple ozier or branch.

It is very necessary to separate the shoots of the different arms in fastening them to the stakes; those from each *aste* being attached to the stake on that side of the vine, as is seen in Figure 27. The shoots of the center arm must be tied up to the center stake.

In pruning the vine after the development of the fourth year's vegetation, the two lateral arms must be formed from two canes of the same vigor, and, in preference, situated below the *astes* of the preceding year; say *a* for the *aste* on the left arm, and *b* or *c* for the *aste* on the right arm (see Fig. 27); these two *astes* should be topped at a length of about twenty-eight inches, and fastened to the stakes placed on each side of the vine, with the inclination shown in Figure 29; only four, five, or six buds, according to the vigor of the subject, are left on these *astes*.

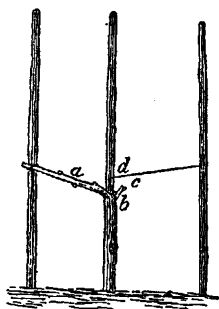


FIG. 28.

One and sometimes two shoots will be developed at each of the

eyes that have been left on these *astes*; they must be tied up very carefully.

The cane *d*, Figure 27, destined to form the center arm, must be topped at a height of from fourteen to sixteen inches, bent almost horizontally, and fastened to a small stake that is there in the *platain*, or high part of the ground, for its special support. Only three or four buds need be left on this *aste*. (C, Fig. 29.)

The vine, when pruned after the development of its new vegetation the fifth year, has the aspect of Figure 30. The right arm, *B*, bears an *aste* of seven buds with an *œil de retour*, *f*, of two buds. The left arm, *A*, bears an *aste* of seven buds, a *côt cabaley*, *e*, of three buds, and, finally, the *aste* of the center arm, *C*, has four buds. This latter should be attached horizontally to a small stake.

The vine is now well established. It is important to allow it a suitable number of shoots, taking care always to preserve perfect equilibrium in the vegetation of the three arms.

Figure 31 represents a vine seven or eight years old, pruned and trained. The right arm, *B*, consists of an *aste* of seven or eight buds, a *côt cabaley*, *e*, of four or five buds, and an *œil de retour*, *f*, of two eyes, on which the *côt cabaley* will be left the following year if the *aste* is cut back. The left arm, *A*, consists of an *aste* of seven or eight buds and a *côt cabaley*, *e*, of four or five buds. Finally, the center arm, *C*, bears an *aste*, *d*, of seven buds, and a *côt de retour*, *f*, of two eyes, on which, the following year, a *côt cabaley* will be established.

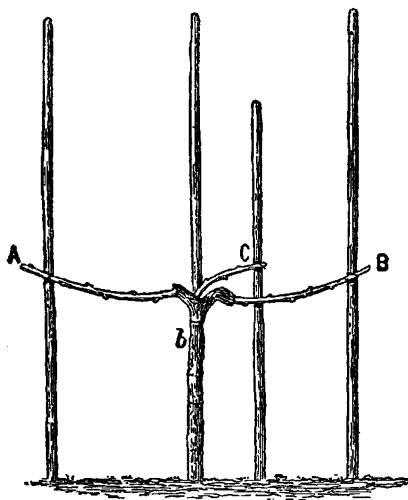


FIG. 29.



FIG. 30.

We have already stated that on the crotch of the *branch cane* (*b*, *c*, Fig. 25), a bud is developed the third year (*d*, Fig. 27). This shoot is destined to form the third arm of the vine (C, Fig. 31).

It is easy to see that if this arm were trained up vertically, as is done in many vineyards pruned by this method, the equilibrium of the vine would be destroyed, the sap being conveyed in greater abundance to it than to the lateral arms trained almost horizontally.

To remedy this inconvenience a very simple method is used in the magnificent vineyards in the bottom lands of Fronsac and Libourne. This method, which is adapted to the particular inclination given to the center arm, is entirely successful in maintaining the three arms of the same vine in perfect equilibrium.

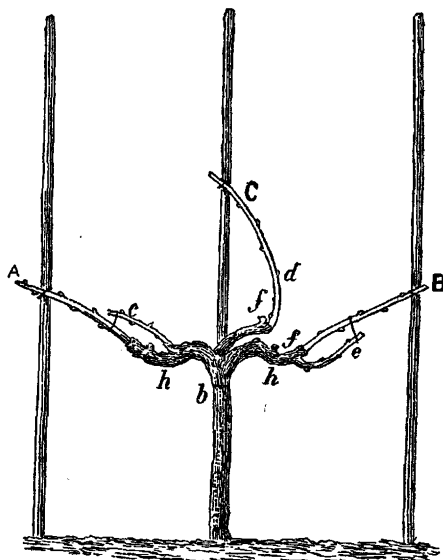


FIG. 31.

We have already seen that the cane *d* (Fig. 27), destined to form the center arm, must be topped at a height of from fourteen to sixteen inches, and fastened horizontally to a small stake placed in the *platain*, only three or four buds being left on it (*C*, Fig. 29). Figure 32 gives a side view of this *aste*, with the shoots developed thereon.

The following year all the wood is cut back to the *aste d* (Fig. 32), and only five or six buds left; the *aste* is then trained as shown in Figure 33.

Figures 32, 33, 34, 35, 36, and 37 give a side view of the center arm from the time of its formation up to the adult age. As we see, this arm is always horizontal for a length of from eight to ten inches. At this point the *aste* is bent upwards and fastened at its extremity to the stake placed at the foot of the vine.

The value of this arm is due to the horizontal position of one part of it; it prevents the sap being conveyed to it in greater abundance than to the lateral arms, and consequently perfect equilibrium of the vine is maintained.

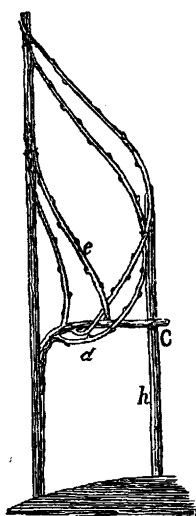


FIG. 32.

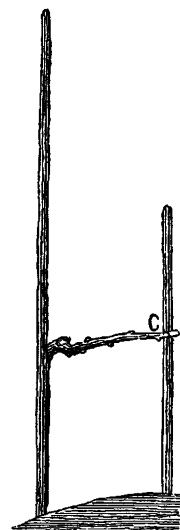


FIG. 33.

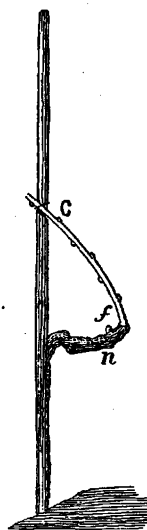


FIG. 34.

The pruning of the vertical arm does not differ from that of the lateral arms; like the latter, it has an *aste* of from five to seven buds, a *côt cabaley* of three or four buds, and a little *côt de retour*. (See Fig. 36.)

On the lateral arms, as well as the center one, the suppressions and renewals should not be made nearer than eight or ten inches to the forking point of the three arms; it is therefore important that the *côt de retour* should not be left nearer than that; say at *h, h*, (Fig. 13) for the lateral arms, and at *n, n*, (see Figs. 34, 37) for the center arm. It is well known that amputations too near the stock very often destroy the equilibrium of the vine.

It is important, to prevent confusion, that the *aste* and *côt cabaley* should not be too near each other; many vine-growers commit this error, and leave nearly as many buds on the one as the other, which is exceedingly wrong. In well executed pruning the *côt cabaley* should be in good position to preserve regularity in the form of the vine; it should be allowed a moderate number of eyes, in order that all those left on it may develop as though the *aste* had to be established there the following year, which, however, is not absolutely necessary.

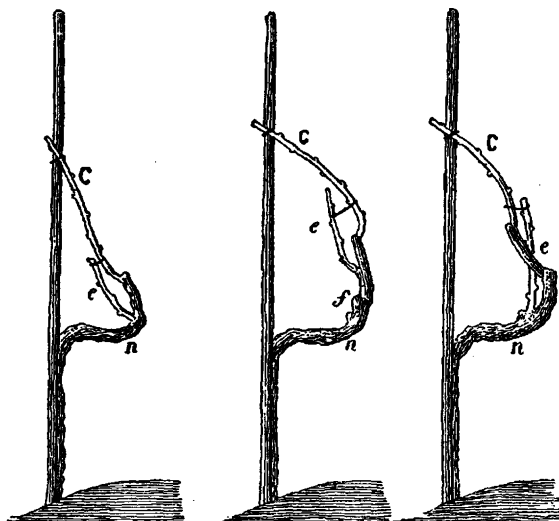


FIG. 35.

FIG. 36.

FIG. 37.

The *côt cabaley* being established under good conditions, there should be no fear of looking at some little distance from it to choose a fruitful *aste*, which must be allowed a good many buds if the vine is vigorous. The *aste* regulates its amount of vegetation itself, putting forth only as many shoots as it is able to nourish, and always in preference those at the extremity, which yield the most fruit. This cane having to be cut back and a new one established on the *côt cabaley* the following year, there is no reason why it should not be bare at its base, whereas, on the contrary, it is very important that the *côt cabaley* should not be lengthened.

We are now going to describe the method of forming the fork of the vine that is most generally used in pruning in bottom land vineyards.

The third year, only one shoot is left on the young vine, and this is topped so that the second bud from the top (*b*, Fig. 38) may be at the average height of the fork that is to be established. Only three buds (*a*, *b*, *c*), are left on this cane, which, if the vine is vigorous, develops as illustrated in Figure 39; that is, each bud nearly always produces two shoots.

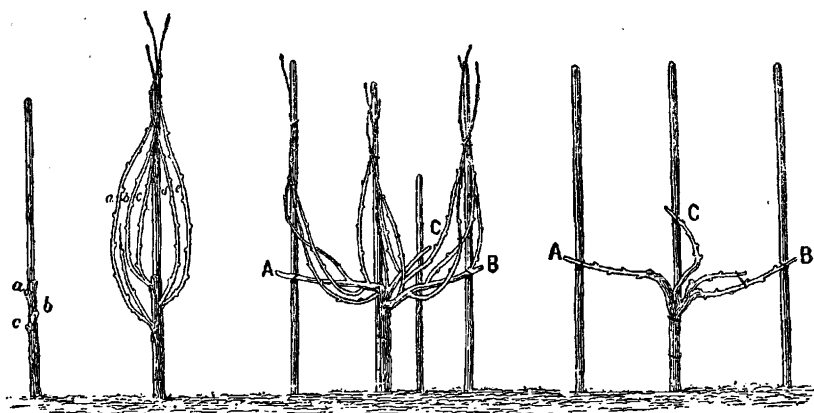


FIG. 38.

FIG. 39.

FIG. 40.

FIG. 41.

The next year the fork of the vine is formed; the cane *b* or *c* (Fig. 39) forms the left *aste*; the cane *e* the right *aste*; and the cane *d*, developed by the counter bud of the cane *e*, serves to form the center *aste*. Figure 40 represents a vine one year after the fork is formed, which is done by the most common method. Figure 41 gives the aspect of a vine two years after the establishment of the fork, and the three arms are pruned according to the principles given previously with regard to vines *sur filleules*.

A vine-grower can always recognize vines forked *sur filleule*, but the ordinary method of forming the fork, if well executed, gives almost as regular shapes.

Towards the end of May all the suckers coming from the old wood are radically removed, taking all those from the ground up to the first shoot of the current year left on each arm for wood for pruning later on, whether it be a *côt de retour*, a *côt cabaley*, or an *aste*. In this operation it is necessary to see whether some new shoots should not be left for establishing *côts de retour*. It must be remembered that only those in good position should be left, if it is desired to maintain the vine in perfect shape.

Pinching, with very rare exceptions, is not practiced in vineyards pruned according to this system; the shoots are simply topped with the pruning knife when the vegetation becomes too weak during the course of the Summer.

Pinching two or three shoots at the extremity of each *aste*, close to the fruit, would produce excellent results. These shoots, generally becoming very vigorous, absorb a great quantity of the sap, while they are of no use for wood for pruning the next year. By pinching them, as we have described, the fruit would not suffer therefrom, and the sap otherwise absorbed by them would benefit the lower shoots, which would nourish their grapes better, and furnish the very finest wood for pruning.

This method of pruning, as well as that of Saint Macaire, described in the preceding chapter, is excellent for rich soil, provided it is well executed; by its means the vineyard will produce all that can be rightly expected of it, considering the fertility of the soil. In identical soils the Saint Macaire method perhaps gives more abundant

products; they are surely inferior in quality to those obtained by the method used in bottom lands. It is easy to account for this difference in quality simply from the appearance of the grapes on the canes at the vintage time. They are better distributed and spread out over the vines more in bottom land vineyards; they thus enjoy more light and heat than the fruit of the Saint Macaire vines, which is crowded together at the extremity of the *tirettes*. In abundant years we have very often found cases where the grapes in the middle of this crowded mass of fruit remained almost white and did not ripen perfectly.

CHAPTER V.

PRUNING IN THE DISTRICTS OF THE GRAVES OR CÔTES.

By the name of *graves* or *côtes*, we mean soils that are not very fertile, which sometimes produce excellent wines, but in which the vegetation of the vine is below the ordinary.

Outside of Médoc, which also may be considered as a gravelly country (*graves*) there exists no special method deserving mention or founded upon principles worthy of argument; each locality has its customs, and the result is an irrational mixture of the divers methods. We will not call attention to the localities where we have met with these eccentric methods; our aim is to induce viticulturists to adopt a rational method; we hope our modest manual will furnish them the means of so doing.

To this end we shall recommend for these *graves* or *côtes*, either a simplified form of the Saint Macaire method, represented by Figures 42, 43, 44, and 45, or of the bottom land method, represented by Figures 46 to 50, which is no other than the bottom land method with the center *aste* wanting. The fertility of the *graves* varies indefinitely. There are cases in which the vine vegetates as vigorously in it as in the best bottom lands, and in which the Saint Macaire method, as well as that of the bottom lands, can be applied without any modification. We shall confine ourselves in this chapter, as we said in the beginning, to soils in which the vegetation of the vine is below the ordinary standard.

It must not be forgotten that all cultivated varieties may be divided into two categories: those that are very fertile, and that should be pruned short if we do not wish to see them soon exhausted, and those whose more difficult fructification demands longer pruning. It is acknowledged, without controversy, that the buds at the base of the canes are less fruitful than those farther from the old wood; hence, in dealing with fine varieties, which generally are not fertile, only as many of those at the base should be left as are necessary for assuring fruit branches for future pruning, and the whole force of the sap be concentrated in the development of a large number of shoots for fruit branches of the current year.

We are convinced that in place of having four or five arms to a vine, as is the case in many localities, two are always sufficient, at least in the soil we are now considering, in order that the vineyard may yield the maximum of production that can be rightly expected of it. If the simplified form of the Saint Macaire method is used

the *côt* will always furnish a fruit branch for the next year's pruning; all the superfluous sap may be utilized for the *flage*, which is pruned more or less long, according to the vigor of the subject. If the simplified form of the bottom-land method is adopted, the *côts cabaley* or *côts de retour* will assure wood for future pruning, while the *astes* will furnish their contingent of grapes. The equilibrium, too, is easier to maintain in two arms than in a larger number.

If it is desired to adopt the simplified form of the Saint Macaire method, the vines must be planted about three feet apart. The forks of the vines are formed the third or fourth year at a height of about eight or ten inches above the average level of the ground, the same rules being followed as in shaping the vines by the Saint Macaire method. (Page 28.)

The two arms should be pruned as *côts*, each being allowed two eyes until the vine is able to support a *flage*; the latter will be proportionate to the vigor of the subject, and must be bent over and fastened to the stake as shown in Figures 44 and 45.

The *flage* must be bent over so as to hinder the flow of the sap in order to compel the development at its base of shoots on which the *côt* may be established as near as possible to the old wood the following year; if the *flage* were not properly curved, the plant would be developed too rapidly, which would necessitate cutting back the long arms to the detriment of the vine.

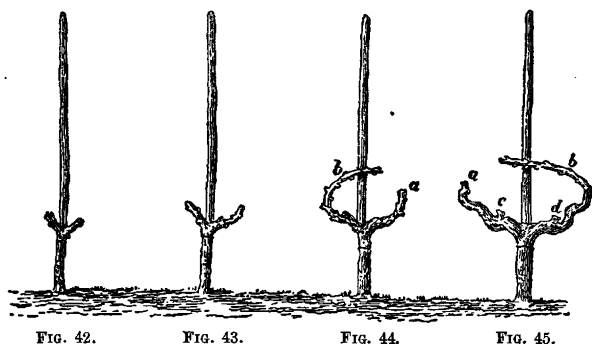


FIG. 42.

FIG. 43.

FIG. 44.

FIG. 45.

In the district of the *côtes*, where the bottom land pruning is in use, it is preferable to adopt the simplified form of this method represented by Figures 46-50.

With this method, the vines have only two arms; they must be planted at a distance of from about four to five feet apart, according to the fertility of the soil. The forking point should be about one foot above the average level of the ground, and is formed either as has been explained to fork *sur filleule*, or by the ordinary method, which gives the result of Figure 46.

This method is admirably adapted to the use of iron wire. The fork being regularly established at the height of ten or twelve inches, as indicated by the horizontal dotted line in Figures 48 and 49, one piece of iron wire should be stretched about fourteen inches above it, and a second piece about sixteen inches above the first. The iron wire is held in place by being fastened to the stakes at the foot of the vine, or, if preferred, to strong stakes placed at every sixteen or twenty feet; all that is needed then for the support of the vines, is a

small stake high enough to reach the first iron wire to which each vine is fastened by a bit of willow. The extremities of the *astes* are attached to the first wire, and the shoots are fastened to and supported by the second. Figures 48, 49, and 50, illustrate this better than it can be described in words.

The young vine having been prepared for the establishment of the fork later on, and having the appearance of Figure 46, will be pruned so that it will have two *astes* formed from the canes *a*, *b*, those being best situated for this purpose. These two *astes*, on each of which only three or four buds should be left, must be fastened to the first iron wire; when the new shoots develop the vine should resemble Figure 47, which represents a vine after the development of its new vegetation the fifth year.

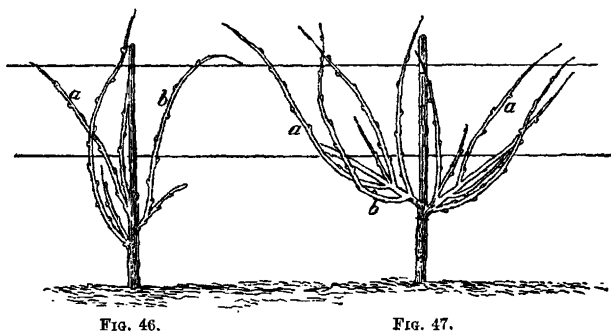


FIG. 46.

FIG. 47.

Figure 48 shows us this same vine pruned and trained; on each arm there is an *aste* of four or five buds with a little *côt cabaley* of two or three eyes. From this on, the pruning should be executed according to the rules given for bottom land pruning, with this difference:

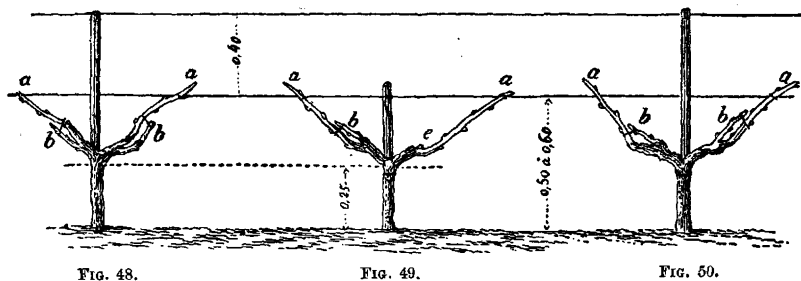


FIG. 48.

FIG. 49.

FIG. 50.

that less buds should be left on the *astes* as well as on the *côts cabaley*, since the vines are less vigorous. Figures 49 and 50 represent adult vines well pruned and trained.

Some viticulturists have contracted a habit of leaving a little *côt* instead of the *côt cabaley*, to avoid the trouble of fastening it up. If it is desired to have a regular and well conducted vineyard, it is indispensable to prune the *côts* so that they are long enough to be tied up, the superfluous eyes being suppressed. If, in certain localities the vines are of bad shape, it is due to the poor choice of wood for the next year's pruning, and to the little care bestowed upon training the canes in the proper direction.

Pinching two or three upper shoots of each *aste*, close to the last bunch of the fruit, gives excellent results; hence we can do no less than to recommend it to persons who are anxious to prosper. It should be done about the end of May, or the beginning of June; that is to say, when the fruit is formed and before the shoot acquires much development. Pinching, thus executed, does not hinder the fruit from developing, nor the grapes from becoming as fine as though grown on very vigorous shoots. These shoots, pinched close to the fruit, seldom start out anew, and the sap that would have been really wasted on them, since they are useless as wood for pruning, flows back to the lower shoots or the *côts*, whose canes are more necessary as wood for pruning.

As we have recommended in the other methods of pruning, it is necessary to be sparing of severe amputations, and never to make them too near the fork of the vine. A moderate amount of fruit must be allowed the vines if we do not wish them to wear out too rapidly.

The suckering should be practiced regularly every year about the end of May. In this operation, all the shoots developed on the old wood are taken off, excepting those that are useful to form *côts de retour*, on which the *côts cabaley* are afterwards established.

CHAPTER VI.

METHOD OF PRUNING VINES IN MÉDOC.

Vines in Médoc are generally planted about three feet apart in every direction; they are pruned, trained, and cultivated in a manner peculiar to that locality. The general aspect of the vineyards is somewhat uniform, although the experienced viticulturist is able to notice quite marked differences.

The low pruning of Médoc is not found to be applied exclusively until one has passed beyond the commune of Blanquefort, where in many vineyards high pruning is used; or, in other words, the vines are supported by long stakes. But, beginning with the commune of Pian and going as far as Bas-Médoc, only low vines are to be seen, if we except some small vineyards, relatively unimportant, in the bottom land on the banks of the river.

In the country, lying between Saint-Julien and Saint-Estèphe, vines yield the most abundant vintage of any locality in all Médoc. This may depend in part upon the quality of the soil, but is especially due to the fact that the pruning is better executed there. In this region the shape of the vines is more regular, and they are allowed to produce more fruit, which does not at all injure the quality of the wine, since it is there that there are grouped the greatest number of classed growths (*crûs classés*).

Plowing in Médoc is effected by means of two oxen yoked by the forehead, passing along on each side of the row. This explains the adoption in that country of stakes a little over two feet long, their average height above ground being about fourteen or sixteen inches. They are all connected, from one end of the row to the other, by a lath of pine wood or an iron wire fastened to these stakes at about two inches below their tops.

A peculiar method of pruning is adopted for this sort of training. We shall describe it as practiced in Pauillac and Saint-Estèphe, the localities where it seemed to us to be, in general, most correctly and systematically executed.

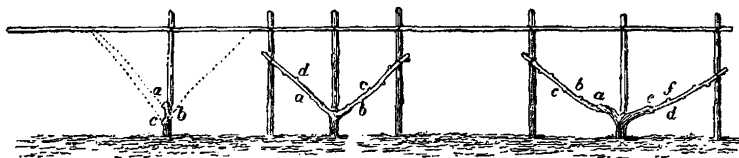


FIG. 51.

FIG. 53.

FIG. 55.

About the age of three or four years, according to the vigor and prosperous condition of the plantation, the vines are prepared to be given their regular shape at the next pruning; the vine is pruned so that only one cane is left (Fig. 51); the next to the top bud (*b*) should be at the average height at which the fork is to be established. A third bud (*c*) is left, in case it will be needed, but all the others are suppressed, either during pruning or when removing the shoots. The average height of the fork is on a level with, or a little above, the crest of the furrow; say about four inches above the level of the ground.

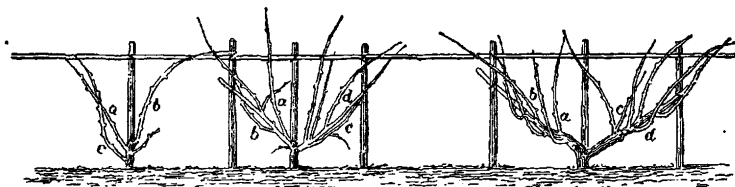


FIG. 52.

FIG. 54.

FIG. 56.

During the course of the year in which this preparatory pruning is executed, the shoots, divided into groups, are carefully fastened to the wire, as shown by the dotted line in Figure 51, and by Figure 52. This last illustration shows the vegetation of the current year of the young vine at the time of pruning.

The fork is to be formed either by the canes *a b* or *c b*; that is to say, those that combine the best conditions of vigor, height, or direction. The two canes are pruned rather long, in order that they may be fastened either to the stakes or the lath, as shown in Figure 53. Only three or four buds are left on each arm; all the superfluous ones above are suppressed.

Before proceeding further, it will be well to initiate the reader in the terms employed in Médoc to designate the several members of the vine in pruning according to this method.

The flexible *aste*, *d* (Figs. 60, 61, and 62), is the fruit branch *par excellence* left only on vigorous vines and those only of a certain age. It is most frequently met with in the vineyards of Saint Estèphe; as many as ten buds are left on it.

The ordinary *aste*, *b* (Figs. 57–62), is the fruit branch of all adult vines; five or six buds are left on it. It is pruned rather long that it may reach, and be fastened to, the wire or the stake; the superfluous buds at the extremity are removed in pruning.

The *tiret*, *c*, is a little *aste* on vines that are not vigorous, as illustrated in Figure 58, or in Figures 59–62, and serves to replace the flexible *aste*, or the ordinary *aste* when the latter becomes too long. Only three or four buds at the most are left on the *tiret*.

Finally, the *côil* or *côt de retour*, *a* (Figs. 57–62) is a spur having one or two eyes, generally left on a sucker spared when the others were removed. These *côts* constitute a means of resource, forming the base of every *tiret* or *aste*; it is therefore important that they should be well situated, as the regular shape of the vine depends upon them. They must never be less than four inches from the fork of the vine, in order to avoid pruning too near this point.

The year the fork is established, three or four shoots are developed on each *aste*, as shown in Figure 54. At the next pruning the young vine should be allowed two *astes* chosen from among canes of good direction, and, as far as possible, of equal vigor, in order to equalize the vegetation, which is an important matter during the first years. From four to six buds, according to the vigor of the subject, are left on the *aste*; these *astes* are fastened to the lath or the stake, as shown in Figure 55.

Figure 56 gives us an idea of the vegetation of a vine pruned as we have just described. We should remark, in passing, that up to this the figures in this chapter have represented vines of very ordinary vegetation, and that is the reason that but a moderate number of shoots is allowed them. In *Médoc*, as elsewhere, we shall recommend shaping the vines when young, and allowing them to develop a good many shoots if their vigor permits it.

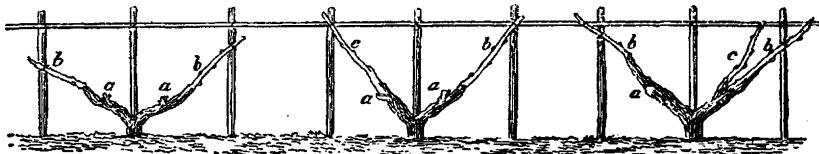


FIG. 57.

FIG. 58.

FIG. 59.

The adult age of the vine is represented by Figures 57–62. The vine (Fig. 57) of below the ordinary vegetation is pruned thus: on the right arm is an *aste*, *b*, of five buds, and a *côt*, *a*, of two buds; the left arm bears a *tiret*, *c*, of four buds, with a *côt*, *a*, of two buds.

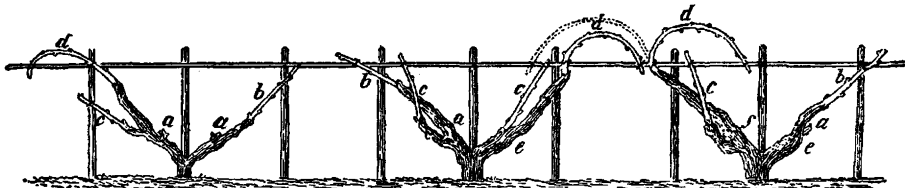


FIG. 60.

FIG. 61.

FIG. 62.

The vine (Fig. 58) of ordinary vegetation bears the same as the preceding; an *aste*, of four or five buds, and a *côt* of two eyes on each arm. The vine (Fig. 59) a little older and more vigorous, bears on its right arm an *aste*, *b*, of five buds, with a *tiret*, *c*, of three buds; and, on the left arm, an *aste*, *b*, of five buds, and a *côt*, *a*, of two buds.

Figure 60 represents a vine twelve years old, and of good vegeta-

tion, bearing on its right arm an *aste*, *b*, of seven buds, and a *côt de retour*, *a*, of two buds. The left arm has a flexible *aste*, *d*, of eight buds, a *tiret*, *c*, of three buds, and a *côt*, *a*, of two buds.

The vine in Figure 61, eighteen or twenty years old, is very vigorous; on its right arm there is a flexible *aste*, *d*, of ten buds, and a *tiret*, *c*, of four buds. The opposite arm has an *aste*, *b*, of seven buds, a *tiret*, *c*, of four buds, and a little *côt de retour* of only one bud.

Figure 62 represents the same vine as Figure 61, only some years older. The right arm having grown too long, has been amputated at the point *e* (Fig. 61), and the former *tirette* become an *aste*; a *côt* (*a*) of two buds, well situated, will serve, ere long, as the base of a *tirette*. The left arm bears a flexible *aste* which will have to be amputated before long at the point *f*, which will make the two arms even.

It is customary for the flexible *aste* to be fastened to the wire beyond the vine as shown in Figure 61 and by the dotted line in Figure 62; however, when two flexible *astes* come together and cause a confusion, it is preferable to train them as represented in our figures.

The figures of this chapter are drawn on a scale of four centimètres for every metre; that is, about one and three fifths inches for every forty inches. As you see, the vines of Médoc, pruned and trained, have the form of an open V. The *astes* and *tirettes* should always be pruned rather long, so that they may be easily fastened to the wire, and the superfluous buds carefully suppressed.

The *astes* should not have too great an inclination, as in Figure 55, because the grapes would be too near the ground, and would be in danger of being covered over during cultivation of the soil. The vines represented by Figures 59, 60, 61, and 62, have the proportions and inclination that constitute good culture.

The forking point, established at a suitable height, must always be taken good care of, and when shortening an arm that has become too long, the amputation should not be effected too near this fork.

Some persons may argue with us on the possibility of this pruning and maintaining the vine in the regularity we describe. With the experience gained from long practice, we assert that this regularity is easy to obtain in vines not subjected to the serious effects of Spring frosts.

With the precautions given, the fork of the vines may be assured at within about four fifths of an inch of the height adopted. We know that in the Spring the old wood on every vine is covered with shoots which have to be taken off. If this operation is performed by intelligent workmen, they reserve, on the vines that need them, some shoots properly situated to form *côts de retour*, with an eye to subsequent pruning.

It is the custom in Médoc to top the shoots at a certain height above the wire with the pruning knife. This operation has the advantage of rendering cultivation easier and assuring air to the grapes. The shoots, not being supported by stakes, would finally interlace and form a complete tangle, in proportion to the vigor of the vines. In some localities the shoots are topped too much; we advise doing it with the greatest circumspection; for it must not be forgotten that every suppression of the foliaceous part of a plant impoverishes it.

As in all the preceding methods, the removal of the shoots devel-

oped on the old wood must be effected about the end of May; only those necessary for the establishment of *côts de retour* are spared.

The varieties cultivated in Médoc are, for the finest: the *cabernet sauvignon*, *cabernet gris*, or *cabernet franc*, *carmenère*, and *petit verdot*, the last two not being cultivated very much. Those chosen as next in rank are the *merlau* and *malbec*, which, in certain localities, is designated under the name of *gourdou*. Nothing poorer than these two last named varieties, which are the best of our ordinary varieties, should be cultivated in this privileged country; unfortunately this is not the case, for in many vineyards commoner varieties than the *malbec* are to be found.

Among the great (*crus*) growths, the *cabernet sauvignon* is the only variety cultivated, and proves satisfactory. Only *cabernets* and a light proportion of *petit verdot* should be cultivated in vineyards of finest quality.

In second class vineyards the proportion of *merlau* and *malbec* taken together should not be more than one fifth; all the other varieties should be banished from Médoc as the *enrageat* is from Sauternes.

Médoc is not the only place where this method of pruning and culture is attended with success. It gives excellent results wherever it is intelligently applied to choice varieties planted in suitable soil. We shall simply cite as examples the domain of Château-Lognac, at Portets, and the domain of Pape-Clément, at Pessac, situated in localities where there is much room for improvement in the usual method of pruning adopted.

We are convinced that this method of culture would be very advantageous for the *graves* in the environs of Bordeaux. There the varieties are generally well chosen, but the pruning is almost everywhere detestable. By the adoption of a systematic method, a vine-grower would arrive at a satisfactory result more easily than by seeking to perfect the method used in that country, which is not based on any principle and is of no advantage to him. In general, the vine-dresser prefers to adopt a new method rather than modify the one he has always used, and which he pretends to understand better than any one else.

CHAPTER VII.

PRUNING WITH UNILATERAL CORDONS ON IRON WIRE.

The method of pruning vines with unilateral cordons trained on iron wire, we have already said, is our invention. We have practiced it on our estate in La Réole for the last twenty years. It is simple, methodical, and very easy to comprehend and apply.

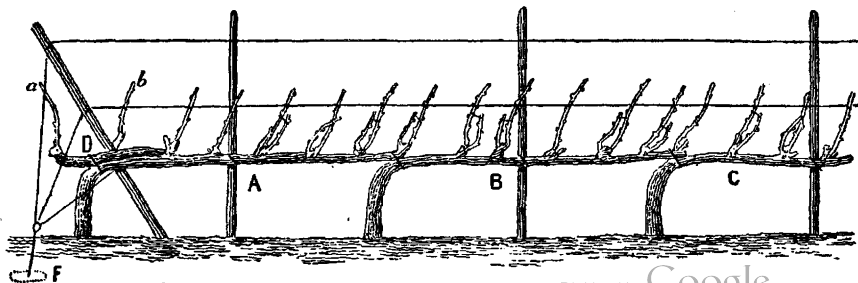


FIG. 63.

Figure 63, which represents part of a row of adult vines, gives an idea of this method. The vines are planted about six and a half feet apart; each one forms a sort of a trellis the length of these six and a half feet, and the extremity so rests on the neighboring stock. Thus there is a continuous *cordon* the whole length of the row. On this *cordon*, at regular distances, are little branches, which we call arms. These arms are very similar to those found in the bottom-land method; they are pruned and brought back to the *cordon* according to the same principles; their conformation is the same, since they are generally composed of an *aste* of five buds, a *côt cabaley* of three or four buds, and sometimes a little *côt* or *œil de retour* of one or two buds.

These vines are trained, as we see, on three iron wires supported by stakes put between the vines. The lowest iron wire supports the *cordon*; the middle one, the *astes*, and the shoots are fastened to the top one.

The iron wires are supported at both ends of every row by a strong stake put into the ground with the inclination shown in Figure 63. These wires are passed through little holes made in the props for this purpose, and are then fastened to the eye of a ringbolt (*F*), firmly fixed in the ground. This ringbolt is made of galvanized iron wire, No. 18, attached either to a stone, a heavy brick, or else to a piece of wood prevented from decaying by some means.

We use only black iron wire, No. 16, annealed with wood; it is expensive, but as it is of very superior quality, it is the most economical in the end. The iron is fastened to the stakes with staples.

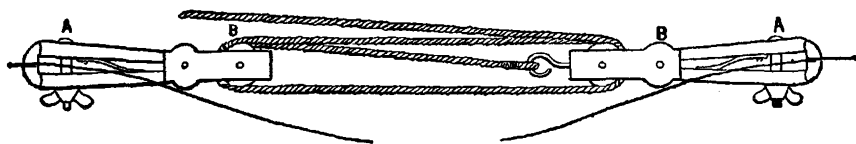


FIG. 64.

To stretch the iron wire we use an apparatus of our own invention, patented by us in March, 1861. This apparatus is to be found at nearly all hardware merchants.

This apparatus (Fig. 64) consists of two hand-vises, (*A, A,*) to each of which is adapted a pulley (*B*), constituting a block and tackle. Figure 65 gives a side view of these vises, with their pulleys.

To tighten an iron wire, the ends of which have been fastened, each of the two vises are firmly fixed at any place on the wire, the two being about two or two and two-thirds feet apart, the block and tackle is manipulated and the desired tension is obtained without effort. In long rows the necessary tension is not always obtained at one trial; when the two vises of the apparatus are brought together, and that is not sufficient, the wire is kept at the point of tension obtained by being held thus with a hand vise (Figure 66):



FIG. 65.

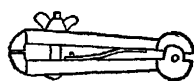


FIG. 66.

One of the vises of the apparatus is moved a little farther back and

the wire is tightened as much as necessary. The iron wire stretched as desired, a ligature is made by means of two eyelets; or better still, if the iron wire is of good quality, it is cut and the two ends lapped about four inches, two little vises (Figure 66) are applied to this intersection, the heads facing each other a little over two inches apart, the stretching apparatus is removed and the ends of the wires twisted together by turning one vise to the right and the other to the left, which makes a very nice and firm ligature. We will not dwell longer on the subject of this apparatus, persuaded that it is well known and has been used by the majority of our readers.

In using this apparatus, if there are only two iron wires, it is immaterial which one is stretched first; but if, on the contrary, three wires have to be used, it is important to tighten the top one first, the lowest next, and the middle one last, taking care not to tighten it more than the two preceding ones.

The height of the *cordons* above the ground varies somewhat, according to the locality. In our culture of La Réole, where the vine is not subjected to frost, after divers experiments we finally adopted the height of twenty inches as being the most advantageous. In places where the vine is subjected to Spring frosts, this height may be raised to about three feet, in order to diminish their effects. The only inconvenience in this arrangement is that the vines are more exposed to the wind, and firmer stakes are required.

The distance between the different wires is: fourteen inches between the lowest one supporting the *cordons* and the center one, and sixteen inches between the latter and the top wire—say thirty inches in all between the lowest and the highest.

All our stakes are of chestnut or locust wood; it will be readily understood that it is best to use only wood that is as imperishable as possible, in order to economise in hand labor, always expensive. Good stakes, firmly planted, sometimes last for ten years without having to be touched, which is a matter of great advantage.

In the *cordon* method, as in the others, the first pruning is executed according to the principles recommended in Chapter I (general principles of pruning).

The second pruning is executed the same as the second in the Saint Macaire method, when the vines are prepared for the fork that is formed the next year (Chapter III); that is to say, a single cane is left, topped at a height of about one foot above the ground, on which only the two or three upper shoots are allowed to develop.

As the *cordon* is to be established the following year, it is well to use some precaution to make sure that the canes will be sufficiently developed and ripened when it is time for the *cordon* to be formed; for we have found this manner of working to be of great advantage.

In order to facilitate training the shoots which develop on this cane, it is necessary to use iron wire supported here and there by stakes. This iron wire is arranged as represented in Figure 67; it should be put where the top wire is to be the following year, to avoid extra trouble; in our vineyard, the *cordon* being established at a height of about twenty inches, the top wire is a little over four feet—about fifty inches—above the ground. This height may vary, as we have already said.

The end stake at *D* should be well chosen and put in to stay. The holes for the other two wires may be bored into it. Then, too, a stake must be put at every vine to support the stock, and for the

young shoots to be tied to until they are long enough to reach the wire. These stakes, *C, C*, (Fig. 67), must be well in the vine row, and on the side of the vines opposite to that on which the *cordons* are to be extended; that is to say, if the *cordons* are to be directed towards the north, the stake will have to be put on the south side of the vines. We will explain the reason for this further on.

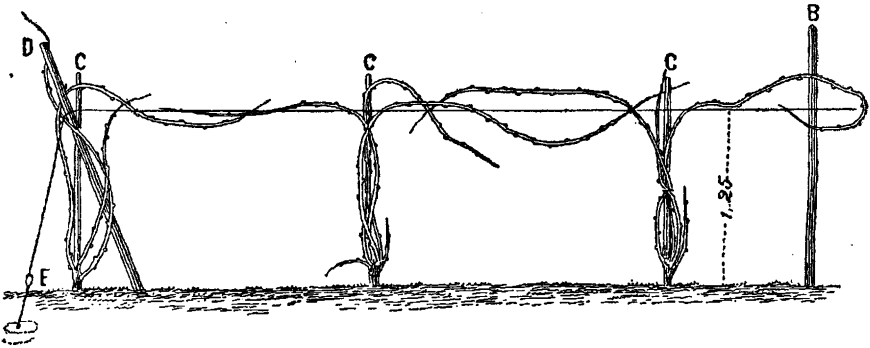


FIG. 67.

The young vines pruned and cared for as we have just advised will have the aspect of Figure 67, the following Autumn, and their canes will be in excellent condition to make *cordons*, which is all there is to be desired. (Fig. 68.)

To arrive at this result the young vines are pruned, leaving only the cane, in which are combined the best conditions of length, vigor, and direction. We repeat that a cane of medium size is preferable to a very vigorous one. Then the stakes are put in, and the iron wire put in place, observing the distance previously mentioned—that is, fourteen inches between the lowest and the center one, and sixteen inches between the latter and the top one.

By Figure 68, we see that the stakes *D, D*, which support the vines, are put at equal distances between the vines; placed about three feet from the vines they do not interfere with the roots, and have the additional advantage of supporting the *cordons* in the middle, thus being of great service when the vines are loaded with fruit; the extremity of the *cordons* is supported by little stakes, *d, d*, or rests on the bend of the next vine, when the stock has become strong enough for the little stake to be dispensed with.

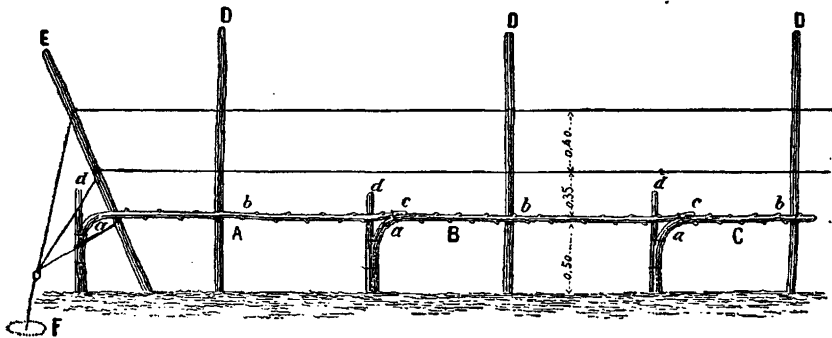


FIG. 68.

A little stake, *d* (Fig. 68), is put at each vine to keep it well in line, guard it from the plow, and facilitate the bending of the *cordon*. This little stake must be high enough to reach the first wire, but there is no harm in its being as high as the top wire. It must always be opposite the bend *a*, and may be dispensed with three or four years after the installation of the *cordons*, when the bend is strong enough to support the extremity of the neighboring vine, which must be fastened to it, as seen by Figure 63.

The wires stretched and the little stakes, *d*, put in place, we proceed to tie up the vines. First, we begin by fastening the stocks to the little stakes in two places, taking care that the top binding is about four or five inches below the first wire. The vines are carefully curved at *a*, *a*, so that the bend is neither too angular nor too open. Then the *cordons* are fastened to the wire in a sufficient number of places to keep them perfectly straight. The canes forming the *cordons* should, if long enough to permit it, lap about four inches on the bend of the next vine, as seen in Figure 68.

It is very essential the first year the *cordons* are installed not to bind them too tight, and the binding used in fastening the *cordons* to the wire must never be wound around twice, as that would be very injurious to good circulation of the sap. It would even be well to examine the young *cordons* about the end of August and cut the ligatures that are too tight, and which, as frequently happens, cause swellings, especially towards the extremity of the *cordons*.

As soon as the young *cordons* are properly bound to the wires, all the useless or superfluous buds are removed, to compel the sap to flow in preference to the shoots that are to constitute the *astes* the following year.

These *astes* having to be established the whole length of the *cordon*, at as regular distances as possible, it is essential for the buds to be developed very regularly on the *cordon*; hence it is well for them not to be too numerous.

The distance between the buds on canes of ordinary vigor being in the neighborhood of three inches, it will be sufficient to leave only half of the buds on young *cordons*, suppressing those on the under side in preference. In addition, all the buds from the ground to at least ten inches beyond the bend of the *cordon* must be suppressed.

When the canes forming the *cordons* are very vigorous, the buds are very far apart; in this case all the eyes are left, or only those suppressed that are situated as just described in the case of less vigorous canes. This remark applies also to certain varieties presenting the same phenomenon.

After disbudding the young *cordons*, every vine will have only about a dozen buds, at regular distances; the young shoots developed will have to be carefully fastened to the center wire as soon as they are long enough.

The first year the *cordons* are established, the viticulturist must endeavor to have the vegetation on every vine regular, that all the eyes which have not been suppressed may develop with about equal vigor.

If all the shoots of the same vine develop with equal vigor, which is somewhat rare, there is nothing to do but to fasten them to the top wires as they lengthen sufficiently. Generally it happens that one or two shoots nearest the bend, and those at the extremity of the *cordon*, develop with more vigor than the others; in this case, to restore uniformity in the vegetation, we need only to pinch the extremities of

the vigorous shoots, which drives the sap to the feeble ones, and by this means the latter will catch up with the others before they start anew. This pinching nearly always suffices to regulate the vegetation. It must be done only about the end of May, or in June, when the vine is well started and the vigorous shoots are about twenty inches long.

The vegetation of some vines is very irregular; the buds will not develop evenly without energetic treatment; hence, it is essential to watch the young *cordons*, and if all the buds have not developed when the vegetation is well started, all the most vigorous shoots must be pinched pretty severely. The backward flow of the sap would cause the feeble buds to start. In general, once pinching the most vigorous shoots suffices to equalize the vegetation. However, it is advisable to examine the vines again a month later to repeat this topping of the too vigorous shoots.

It is readily seen that pinching is necessary, but should never be executed in a general way, as many people think. It is well to do it on young vines, with the sole aim of regulating the vegetation. It is also necessary to do it with adult vines, as will be seen farther on, to prevent the shoots at the extremity of the *astes* from becoming too vigorous, to the detriment of the lower shoots, which alone are useful for future pruning.

Many viticulturists abuse this practice. They think that by pinching all the shoots at the time of florescence, they prevent *coulure*. This is a serious mistake; they thus favor the development of the most vigorous shoots, which start first and absorb all the sap. Others sucker to excess, in order to give air to the fruit. This practice is equally bad; by too radical suckering a great quantity of young leaves are taken off, which stops the regular elaboration of the sap. The roots, as well as the whole organism of the plant, suffers from this. It would be preferable to sucker them frequently, taking off only a little each time.

If a pretty severe frost or hailstorm should occur the first year the *cordons* are established, there would need be no hesitation as to pinching the shoots severely, so as to induce the development of young shoots below the bend of the vines. These young shoots would have to be carefully taken care of, so that they may take the place of the old *cordons* the following year.

It is important that the development of shoots on the young *cordons* should be all that is desired, in order that at the following pruning the *astes*, which will constitute the arms, may be installed with the regularity seen in Figures 63 and 72. Figure 69 represents the vegetation of well-trimmed young *cordons* the first year of their installation.

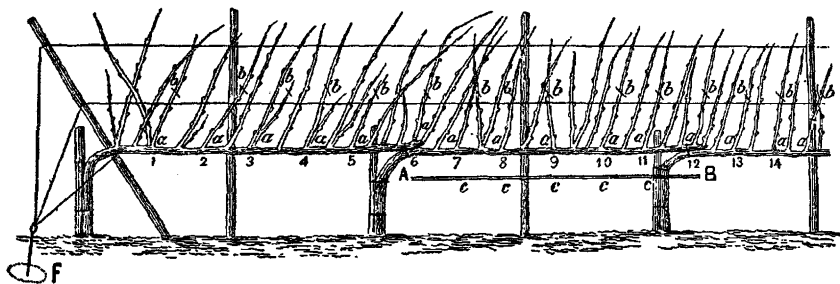


Fig. 69.

Choosing the *astes* is an operation demanding unremitting attention on the part of the vine-grower, if he wishes to obtain regularity.

A vine-row is composed of a succession of vines arranged as represented in Figures 63, 70, and 72. These vines form an uninterrupted *cordon* on which are situated, at very regular distances, arms which must be treated as little single vines.

These arms are about a foot apart. The vines being about six and a half feet apart, each of them consequently has, on an average, six arms. This arrangement and distance between the arms are necessary to avoid confusion, and to make the canes as well as the grapes ripen perfectly. After the development of the vegetation the fourth year, that is to say, the year following the installation of the cordons (Fig. 68), the vine, when the time for pruning has come, presents the aspect of Figure 69, which shows us two four-year-old vines of the *malbec* variety, vigorous, and of regular vegetation.

The pruning now in question is the most difficult, or, to speak more correctly, the one deserving of the greatest attention on the part of the workman. The arms once established never have to change their place, hence it is important in choosing the *astes*, to see that they are at the right distance from each other.

By Figure 70 we see that the last arms, *c, c*, of each vine are on the extremity of the *cordons*, and rest on the bend of the next vine; hence, if we wish to observe the regular distance of about one foot between the arms, the first arm of the next vine must be about sixteen inches from the perpendicular of the stock. This arrangement is advantageous, because if the first arm was too near the bend, the sap would be carried there in too great abundance, so destroying the equilibrium of the arms of the several vines.

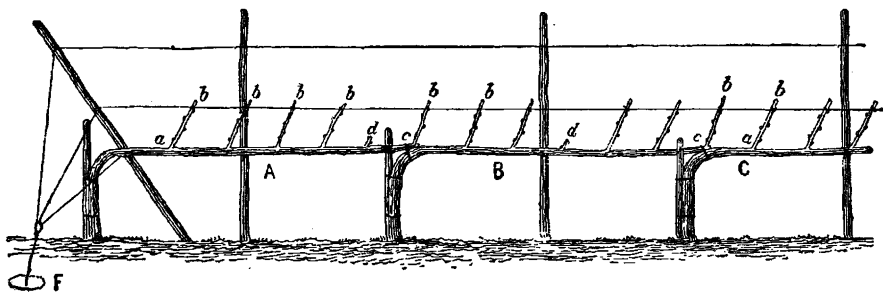


FIG. 70.

The place of the first arms, *a, a*, as well as the last ones, *c, c*, of every vine being determined almost mathematically, it is very easy to fix the position of the other four.

If a person has not had some practice in this work, he can do it with precision by means of a gauge *A, B*, (Fig. 69), on which is marked the divisions, *c, c, c, c*, indicating the distance to be allowed between the arms.

When pruning the vine-grower can make use of this gauge, which indicates, without his experimenting, the canes best situated to serve as the basis of each arm. In the case of very important vineyards, the choice of shoots that are to form the arms might be made by an intelligent workman, who, gauge in hand, would mark those that have to be reserved, either by topping them with the pruning shears, or putting a little paint on them. Experience has proved that one

man can mark out the work for four or five workmen, and thus shorten their task very much. The gauge must be applied close to the *cordon*, the end *A* opposite the bend of the vine, that is to say at the last *aste* of the preceding vine. The figures 1 to 14 (Fig. 69), indicate the shoots that are to form the arms. They must be topped so that they can be easily fastened to the second wire. All the other shoots will be suppressed close to the *cordon* as neatly as possible. As the arms do not have to be displaced while the *cordon* lasts, it is desirable that no other shoots should develop on the *cordon*. That is why we insist that all the shoots, excepting those left to form arms, including those at the crown of the base, should be radically removed.

The first year of the installation of the arms, every one must be topped at *b*, *b*, *b*, and attached to the second wire, as in Figure 70. The cane *d*, which is to form the fifth arm of the first vine (same figure), not having acquired sufficient development, is pruned as a *côt* of two eyes; an accident happening, during pruning, to the cane that is to form the third arm of the second vine, that also has to form a *côt*.

This first year only from three to six buds need be left on each arm, according to the vigor of the vines. It is well to remove the superfluous buds at the time of pruning, taking care not to leave too many on the arms, so as to compel nearly all the important ones to start with a certain amount of vigor. It will be readily understood that, if a great majority of the buds develop vigorously, it will be easy, by means of pinching, to establish perfect equilibrium between the arms. It is also important, at this pruning, to do away with all the old ligatures that are too tight, which would impede the circulation of the sap.

It sometimes happens that the cane forming the *cordon* cannot reach the next vine; in this case the arms are installed on the first part of the *cordon*, and the latter is prolonged by means of a cane in good position, which is fastened to the next vine and disbudded like a one-year-old *cordon*. (See Fig. 71.) Then less buds are left on the arms, and they are pinched a little more severely to oblige the sap to flow to this prolongation.

Figure 71 represents three vines which, the first year, were not long enough to reach the bend of the neighboring vine. The dotted lines in the figure indicate the arms that are wanting, and which must be installed the following year; it is essential to pay careful attention to the shoots destined to form them.

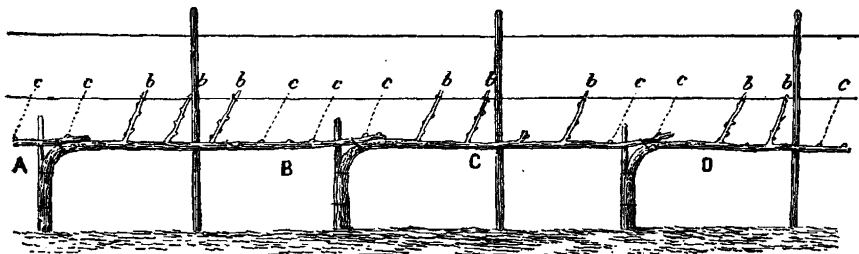


Fig. 71.

The bend of the first vine of each row is bare, as there is no *cordon* to be supported by it; this fault is remedied by having a cane, *c*, come

from the base of the first arm (Fig. 72), which lies horizontally on the *cordon* towards the end of the row; the following year two arms are left on this cane at the dotted lines, *b, b*, thereby filling the empty space, as shown in Figure 63 at the beginning of this chapter.

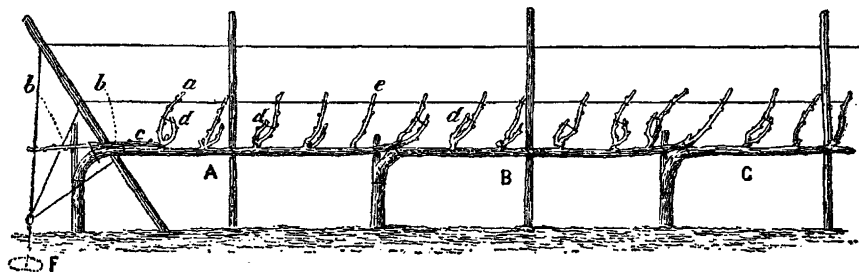


FIG. 72.

While the vines are young, and especially in the case of certain varieties, we must not neglect to tie up the shoots, so as to keep them from being injured by the wind. Such accidents are always unfortunate, but especially when they happen to the shoots necessary for the formation of arms.

This first year of the establishment of the arms the pinching is executed as follows: About the end of May, when the clusters of young grapes are well formed, the weather warm, and the development of the vegetation well under way, one or two of the shoots at the top of every arm is pinched close to the last bunch of fruit. This operation is to strengthen the lower shoots, which must furnish the elements of the next pruning. Pinched off close to the fruit the shoots do not start out again, or only very little; they nourish their fruit as well as though they had not been pinched, and the sap necessary to the others is not wasted on them.

When the arms are regularly established, such assiduous care and intelligence are no longer required in pruning the vine. The vine-grower has little to do excepting to prune the arms, which may be considered as so many separate vines planted on the *cordon*. If the *cordons* and arms have been regularly installed as we have described it is an easy matter, excepting in very rare cases, to maintain uniformity in the vegetation of the six arms on the same vine; we are sure that the vine-grower could easily remedy any accident that might happen.

Having given the method of forming the young *cordons*, it remains for us to study the pruning of the arms, which, as we said before, should be considered as little vines planted regularly along the *cordon*.

This pruning is very simple: the same rules are observed as in pruning the arms of the bottom-land vines; as in that system, we shall call the principal branch *c*, the *aste*; the secondary fruit branch *b*, the *côt cabaley*, and the little *côt* of one or two eyes, *a*, the *côt* or *œil de retour*. (See the arms in Fig. 80.)

It is essential to see that these arms do not become too long; they should be cut back as near as possible to their base, near the *cordon*. This result will be easily obtained if too many shoots are not allowed to develop on the arms, and if they have been regularly pinched.

Imbued with these principles, we will take a young arm recently

installed and having seven buds, *a, b, c, d, e, f, g* (Fig. 73). At least five buds, *c, d, e, f, g*, will start when the vegetation of the vines begins to develop; the shoots *f* and *g* will be pinched close to the last bunch of fruit as soon as the latter is well formed, which occurs about the end of May; this operation is to provoke the development of the bud *b*, and perhaps of the bud *a* too. Figure 74 shows the shoots of this

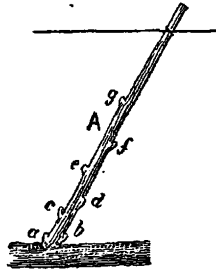


FIG. 73.

arm, established on a very vigorous *cordon*. Figure 75 shows us the same arm established on a less vigorous *cordon*, and its vegetation indicates plainly that in this case too many buds were left on the arm.

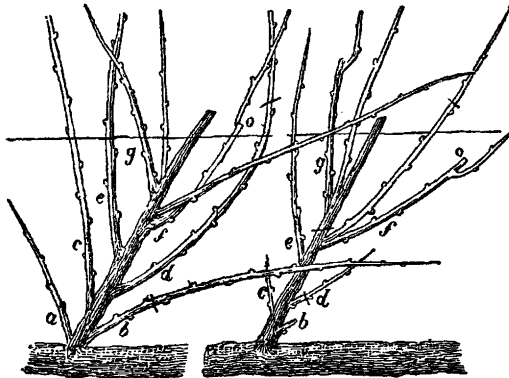


FIG. 74.

FIG. 75.

To prune the arm (Fig. 74) the *côt cabaley* is left at *b*, the cane *d* forms the *aste*, and the cane *a* is cut very close to the arm; all the others are suppressed. This arm is shown pruned and trained in Figure 76; the *aste d* has six buds and the *côt cabaley b* three buds.

The arm (Fig. 75) having been overcharged, must be sparingly treated; we shall leave on it only an *aste* of four buds on the cane *f*, or the other shoot coming from the same eye; a *côt* of two buds on the cane *d*, and a little *côt* of one eye on the cane *b*. This arm is shown pruned and trained (Fig. 77).

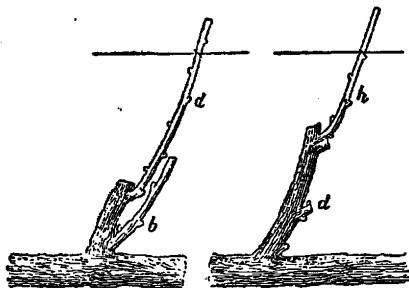


FIG. 76.

FIG. 77.

As we said before, the arms (Figs. 74 and 75) installed on different *cordons* show the result of the vegetation of the pruned arm (Fig. 73). One has put forth its new wood with much vigor, and has been pruned in accordance with this excess of vegetation. The other, having vegetated poorly, has also been pruned accordingly. The arm in Figure 76 has seven very fructiferous buds, five of which are on the *aste* and two on the *côt cabaley*. The arm (Fig. 77) has only four buds which may be considered fructiferous.

Figure 78 shows the new wood developed by pruning an arm established on an adult *cordon*. Pinching the two principal top shoots at *o, o*, has caused several fructiferous counter shoots to develop, which have yielded fruit; this operation has also strengthened the new wood on the *côt cabaley*.

Pruning this arm is a very simple matter; it may be confined entirely to the *côt cabaley*, suppressing the old *aste*; the *aste* for this year may be formed from the cane *c*, situated on the old *aste*; this depends, though, on the vegetation of the vine in general. If all the arms of the vine are of about the same vigor, an *aste* of six buds will be left on the cane *c*, a *côt cabaley* of three buds on one of the canes coming from the old *côt cabaley* and growing in the right direction, and a little *côt* of one year on the small shoot *a*. If this arm was more vigorous than the others established on the same *cordon*, there would be no need of hesitating to cut back the old *aste* and leaving only one *aste* on one of the canes coming from the *côt cabaley* with a little *côt* of two eyes on the cane *a*.

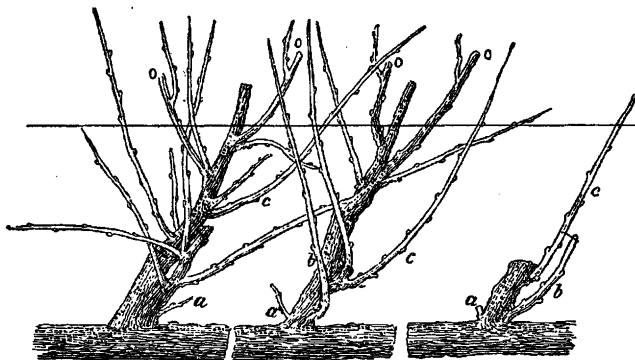


FIG. 78.

FIG. 79.

FIG. 80.

Figure 79 shows the development of vegetation on the pruned arm (Fig. 77). The two upper shoots of the *aste* having been severely pinched at *o, o*, close to the last cluster of fruit, the sap has been driven back, and the buds of the two small lower *côts* have developed well. The vegetation of this arm, which, the preceding year, fell far short of the mark (See Fig. 75), has been completely reestablished, by means of a moderate charge and by pinching the two upper shoots of the *aste*. By so doing, some of the vintage has been sacrificed; but the subsequent vintages will make amends for this momentary loss. In pruning this arm (Fig. 79), an *aste* of five or six buds, according to the vigor of the vine, is left on the cane *c*, and a little *côt cabaley* of three or four buds on the cane *b*. The little cane *a* has been pruned to one eye. This wood is useless in the present case, *côt cabaley* being very near the *cordon*, and moreover it is not in a good situation; hence there would have been no harm done if it had been passed altogether; but if the canes were higher up from the *cordon* it would not do to neglect leaving it. When an *œil de retour*, as in this case, is situated in front of the arm, that is on the side towards the bend of the vine, it must be pruned to one or two eyes, according to the disposition of the buds. It is indispensable for the top bud to have a natural tendency to develop in the direction of the inclination of the *astes*, or at least in a vertical direction. If the first bud, near the old wood, has this tendency, only that one must be left; in the opposite case, the second one is left and the first one suppressed. We insist on this little matter, which might seem too circumstantial to many of our readers; but if we wish our *cordons* to come up to the mark in regularity, the smallest point must not be neglected. It is especially requisite that the workman who does the pruning should understand the value of all these remarks. When he has once fallen in the habit of observing these points he will be no longer in accomplishing his work than if he had taken no account of them.

As in all other methods the intelligent vine-grower should have three things in view: First, the shape, or, in other words, good direction of the arms; second, the equilibrium of all the arms on the same *cordon*; third, the number of buds that should be left on the arms of the same vine.

To maintain the shape, or good direction of the arms, the *côts de retour* must be well situated; on them depends the whole system of the arms; it is important that the buds that furnish these *côts de retour* should be in the right place; it is preferable to prune one and even two years on a long *aste* rather than leave a *côt de retour*, which would not combine the necessary conditions, and which, moreover, would hinder the development of other shoots better situated.

The equilibrium of the arms of the same vine is maintained by leaving less buds on the very vigorous arms by cutting back the feeble shoots found on them, or else by pinching the shoots of the vigorous arms more severely. In some cases several of these means must be employed at the same time.

As for the number of buds to be left on the arms of the same vine the vine-grower must not forget that fertile varieties must be charged less than fine varieties; that a great many buds must be left on vines growing in fertile soil, if they are vigorous, while those in poor soil must be spared. After first taking into account the preceding pruning, which can be done at a glance, the charge must be augmented

if the vegetation has been too vigorous, and lessened if the vegetation has been feeble, and if too many of the buds have proved abortive.

By taking care to renew the arms frequently, that is to say, cut them back near the *cordon*, we avoid making severe amputations, which is an important matter; the latent buds on relatively young wood develop better than those on old stumps which do not come to anything. Moreover, we have found that *astes* situated on newly formed arms are more fructiferous than those on too old ones, hence it is well to cut the arms back every three or four years.

It is very seldom, during a period of two or three years, that some well situated shoot is not developed at the base of the arm near the *cordon*; it must be pruned to one or two eyes, taking care that the top bud is inclined to develop in the right direction, as we said before. The following year the *côt cabaley* is left on this *côt de retour*; two years after the establishment of the latter, all the wood used in pruning is installed there, and the other parts of the arm suppressed.

When an arm has grown too long, is of bad shape, or not well situated, there must be no fear of leaving a *côt cabaley*, or even an *aste*, on a branch developed on the *cordon* at a suitable point; then the faulty arm is cut back as soon as possible, that is, when the new arm is well established. In such cases this *aste* or *côt cabaley* is only moderately charged, so that all the eyes left on it will develop; it must be pinched if necessary.

All the *astes* should be fastened to the center wire, with a slight inclination in the direction given to the *cordons*, as may be seen by the divers illustrations of this chapter. The *côts cabaley* must be attached to their *aste*.

An excess of vegetation is injurious to fructification; that is why we must not fear to charge a very vigorous vine; it cannot be killed or impoverished in one year; if it yields a quantity of fruit, we profit by it; if its vigor is affected, we lighten its charge the next year. On the other hand, a vine overcharged dwindles, and its fruit is light colored and of bad quality; overcharging it several years in succession may even prove fatal to it. Consequently we must, as far as possible, keep to the just medium, and not fall into these errors.

All the wood developed between the arms must be cut back as close as possible, as well as the shoots put forth in bad situations at the base of the arms; if among the latter there were some well situated, but not needed at the time for *côts de retour*, they would be pruned crown fashion. The swellings, or the points where the shoots start from the old wood, are garnished with a multitude of eyes, which it is well to spare when they are properly situated. These reserves are useful for future pruning.

When, in consequence of a very heavy hail-storm, a disastrous frost, or some other cause, the *cordons* are mutilated or robbed of their arms, they are easily reformed. For this purpose, when ridding the vines of suckers in the Spring, one that is well situated must be left at the foot of each vine; the following year it is pruned to three or four buds, just as is done at first in preparing the vine for the regular shape to be given it at the next pruning. However, the old *cordon* is still left on the vine, and is pruned as well as possible, so that it will bear fruit, without paying attention to its regularity during the time that elapses before it is cut off. The canes left at the base of the stocks should be supported by rather long stakes, and only two shoots allowed to develop on them; these shoots

must be fastened to the top of the stakes. The next year all the old vines are cut down and new *cordons* formed from the canes prepared as we have just described.

Our oldest *cordons*, some of which are ten inches in circumference, were very much affected by the severe Winter of 1870-1871. The snow remaining on them for so long froze many of the arms, which obliged us to form new *cordons*. They were reconstituted by the method we have just explained. They now present as regular an appearance as those five or six years old.

The younger *cordons*, that is those under twelve years of age, did not suffer from the cold, and not one of their arms was injured.

If, in consequence of an accident, one of the arms of the *cordon* is lost and no other comes in the same spot, it is replaced by taking a suitable cane, developed at the base of the preceding arm, which is inclined horizontally along the *cordon*; only one or two eyes, situated just about where the new arm is to be installed, are allowed to develop on this cane. The next year the best situated cane is taken for the new arm, and is then pruned as though it came from the *cordon* at that spot.

Vines pruned à *cordons* must be pinched every year. This operation is performed about the end of May or the first part of June, when the fruit is well formed and the vegetation in its prime. This work is elementary, and may be done by women or children; one or two of the very top shoots of every *aste* are pinched close to the last bunch of fruit; generally there are two *astes*, never more than three. The shoots to be pinched are easily recognized, situated as they are at the top of the *aste*, and surpassing all the others in their vegetation.

These shoots would be of no advantage for future pruning, and would absorb a great quantity of sap to the detriment of those at the base of the *astes* and of the *côt cabaley*. Pinching close to the fruit does not injure the grapes, and, moreover, provokes the development of shoots that would otherwise remain stationary; these shoots yield their share of fruit; they augment the production materially, and at the same time are useful as wood for pruning, for the shoots at the base of the *aste*, of the *côt cabaley*, and the *côts de retour*, are the ones most benefited by the pinching.

The method of pruning with unilateral *cordons*, well executed, is incontestably the best of all those practiced in the Gironde. No other system is more favorable to the exigencies of vegetable physiology; the sap circulates freely in a single branch to be distributed equally among all the arms of the same vine. No other form presents this mathematical regularity in the arrangement of the fruit branches, nor this symmetry that permits of having so great a number of the latter without any confusion.

The length of the fruit branches is not exaggerated as in some methods, and yet is sufficient to render fine varieties fructiferous. In consequence of the pinching the shoots are numerous and develop with about the same vigor, which is one proof of the perfect distribution of the sap. Then the grapes are spread out over a very large surface, where they can enjoy, although so numerous, the amount of air and sunlight necessary for their good maturation. They produce excellent wines, as long as the soil is suitable and proper varieties are cultivated.

The rows being very straight and the arms always maintained in the proper direction, cultivation of the soil is easy, and but little left

by the plow for cultivation by hand, which is a point of economy in this work.

Firm stakes and good iron wire are expensive, but the most advantageous in the end, for they last a long while and greatly diminish the amount of hand labor.

We began to use this method of pruning *à cordons* in the year 1846; it was not until about 1850 that, after conclusive experiments, we applied arms to the *cordon* similar to those employed in the bottom land method. From this time on all our vines were trained *à cordons* in spite of the discouraging predictions of the learned men of our country; and we have never had cause to repent of thus transforming our vineyards.

We know very well that many vine-growers have condemned this method as impracticable in extensive vineyards. We assert that if they have failed in its application they should lay it to their inexperience or to the ill will of their workmen. However, it is not for us to sound its praises; for the edification of our readers we shall simply place before them, without comment, documents that we have received from various commissions or from the most competent viticulturists.

[N. B.—Here follows reports of meetings, etc., in which are discussed the merits of the Caznave system of pruning, but which are too voluminous for this work.—TRANSLATOR.]

CHAPTER VIII.

THE GUYOT METHOD.

Dr. Jules Guyot rendered great service to French viticulture by bringing it to the notice of many intelligent men who otherwise would never have paid it any attention. In 1850 he planted out a vineyard in Champagne, in very poor soil, and applied a special method of pruning, and also of protecting his vines from frost. He obtained magnificent results.

In 1861 he was commissioned by the Minister of Agriculture to go through the divers viticultural departments of France in order to study the present methods of viticulture; to make known the systems whose efficacy had been established by experience and practice; to institute by his advice and instructions a desirable progressive movement; and finally, to make out a general report on the result of his observations and studies. Such was the ministerial programme. Dr. J. Guyot carried it out scrupulously in the seventy departments which he went through and studied, from 1861 to the end of 1867, when he was obliged to suspend his studies on account of ill health. His reports to the Minister of Agriculture are profound works, which will be consulted with advantage for a long time to come.

We shall not describe his method of protecting the vines from frost, which, to some extent, forms part of Dr. Guyot's system of culture. The latitude of the Gironde happily exempts us from this labor, which would not compensate us for the expense involved therein. We must consider that, with us, the high classed vineyards, which alone would be able to stand the expense, however little their vintage would be augmented thereby, do not suffer from frost frequently. Consequently

we shall speak only of the system of pruning known in France as the Guyot method.

This method is based upon rational principles. It permits of obtaining, with vines planted in soil of average fertility, a relatively abundant fructification, provided the soil is kept in good condition by means of improvements. It is very simple; very easy to apply however little it may be studied. We shall describe it as it is explained by Dr. Guyot himself in his numerous letters.

The most suitable space to allow between the vines is about three feet in every direction; however, this distance may be diminished or increased.

The plants, as well as the stakes, must be in as straight a line as possible, to facilitate plowing. We simply mention this point, persuaded that our readers fully understand its importance.

Every vine must be treated, in its infancy, as described in the chapter on general principles of pruning; about the age of three years the vines are pruned to a single cane, leaving only three eyes, and taking care that the top bud is not more than ten inches above the average level of the ground.

This work done, a stake about five feet long is put at the foot of each vine. This stake serves as a support for the vine and as a means of keeping the latter well in line; it also serves to support the shoots which will be developed, and which must be carefully tied up.

The following year the vines must be installed as represented in Figure 81; every vine has a little *côt* (*a*) of two buds, and a fruit branch (*b*, *c*) of ten buds. The fruit branch is attached horizontally to an iron wire (*B*), stretched at about one foot above the ground; another wire (*A*), about sixteen inches above the first one, serves as a support for the shoots and canes. The iron wires are supported by the stakes *d*, *d*, from four to five feet high, placed at the foot of every vine, and by smaller ones (*e*, *e*) put between the vines. The latter are not indispensable, but they make the framework firmer, and permit using No. 12 wire for *B*, whereas otherwise it would be necessary to use No. 15, the same as must be used for *A*. The iron wires are fastened to the large stakes by means of tacks or staples; the little stakes (*e*, *e*) are simply fastened to the wires with osiers, when tying up the shoots.

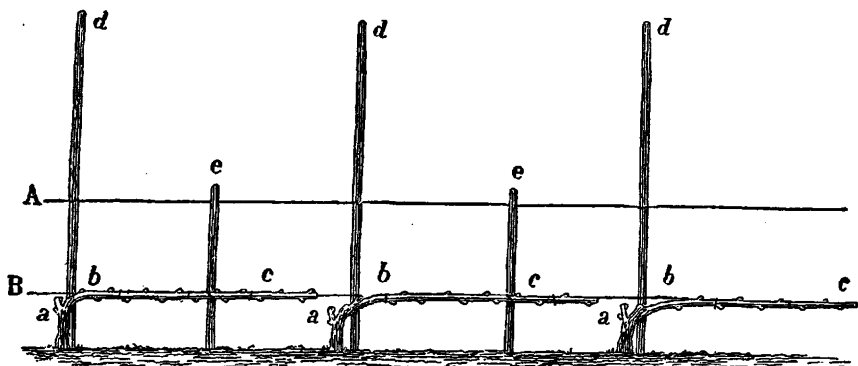


FIG. 81.

When the shoots begin to develop, all those put forth on the old wood must be removed, and also those on the fruit branch that would not bear grapes. As the shoots of the fruit branch attain sufficient length to reach the wire *A*, they must be fastened to it; they must all be pinched at the second leaf above the top bunch of grapes, or a little higher up if necessary, in order that they may be long enough to reach the wire. The two or three shoots which will develop on the *côtes* *a, a, a*, must be carefully fastened to the stakes *d, d, d*, without being pinched; they may be topped above the stakes, towards the end of vegetation, when the development of lateral shoots on these canes is no longer feared.

The long fruit branch requires to be trained horizontally, in order that the sap may be distributed without difficulty to every shoot. It frequently happens that at the beginning of vegetation some shoots are backward, while others develop rapidly; sometimes pinching suffices to regulate the vegetation; however, the vines must be inspected frequently to repinch the shoots, which, having been pinched already, would start out again too vigorously, and also to pinch those which, being backward, could not be subjected to this operation before.

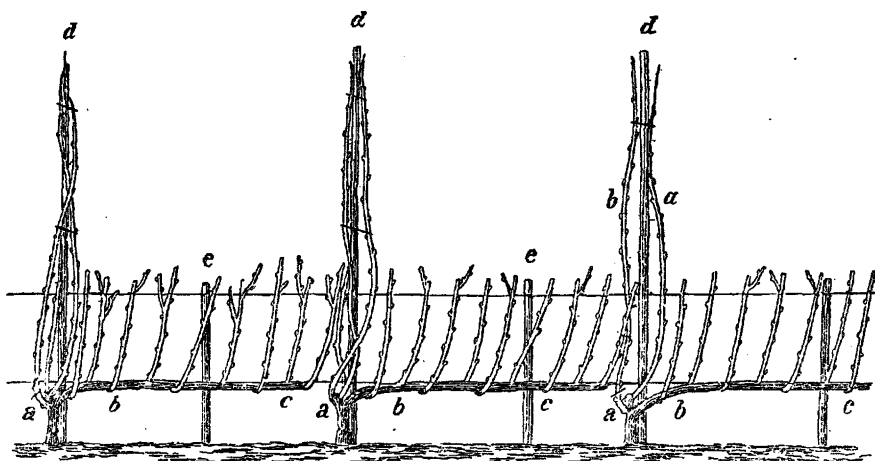


FIG. 82.

By proceeding as we have described, the vine will have the aspect of Figure 82 in the Autumn of the year, when it is first trained on the iron wires. The vine assumes its perfect shape this first year. Consequently, from this time on, the pruning is the same.

Let us take an adult vine, after the fall of the leaves (Fig. 83). To prune it, the fruit branch, *b, c*, of the preceding year must be cut off at the point *j*, and only the three canes, *f, h, g*, left on the vine. The cane *f*, being the lowest, must be pruned, to form the *côt* of two eyes, at the point *i*; then the worst situated of the two canes, *g* and *h*, must be suppressed; as for the remaining one it must be pruned for the fruit branch to a number of eyes proportionate to the vigor of the subject.

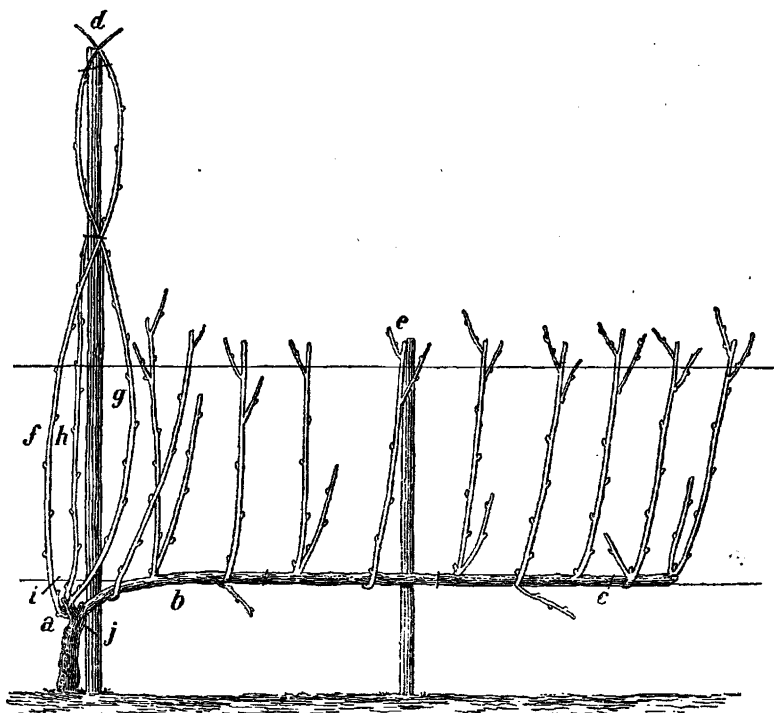


FIG. 83.

The useless shoots on the adult vines are removed and the others pinched, as is done the first year the young vines are trained on the wire. All the shoots on the fruit branch are pinched to prevent their attaining too great development, to the detriment of the *côt* that is destined to furnish the wood for pruning the following year.

The height at which the fruit branch and *côt* should be installed above the ground, and which we have fixed at ten inches, according to Dr. Guyot's directions, might be augmented; we are sure that in some localities, chiefly in humid soils, the vines would only be benefited thereby; however, we must not lose sight of the fact that no matter how carefully we prune, the vines gradually become higher as they grow older, hence it is well to take this fact into account, so as not to start at too high a point. Whether the stock is high or low the principles of pruning are the same; if the vine is higher the stakes must be longer and stronger, therefore it is to one's interest to keep them low, if there is nothing to hinder so doing. The owner of the vineyard who is acquainted with his land can best determine the proper height.

When the head of the vine becomes too high, we leave on the stock, at a suitable point, a shoot which is pruned to one eye the first year; the shoots developed on it are pinched at the height of the top wire. The following year, the *côt* is left on this cane, and the fruit branch above on the *côt* of the preceding year. At the third pruning, the vine is cut down close to this *côt*, which must be properly

pruned, and from this time on the wood for pruning will be found at the height at which it was established in the first place.

This method of pruning, as we see, is very similar to the Saint Macaire method. As in the latter, every vine has a long fruit branch and a *côt* of two eyes to furnish wood for future pruning. The difference between them is, that in the Guyot method the fruit branch and the *côt* are situated on a single arm; the first is inclined horizontally throughout its entire length, and the second is situated at its base; then all the shoots developed on the fruit branch must be regularly pinched. In the Saint Macaire method, the extremity of the fruit branch is bent over to form an arc or tortillon; the vine branches into two arms; the fruit branch is established on one and the *côt* on the other; moreover, pinching is not practiced.

With the Saint Macaire method, in good soil, a larger production is obtained than with the Guyot method; this is owing to the fact that, in the first method the framework of the vines is more developed, the fruit branch longer, and the vegetation less exhausted by pinching; but in soils of average fertility the Guyot method is preferable, both on account of its simplicity and the production; the fruit is better distributed and consequently has more air.

Then, too, the Guyot method is similar to ours the first year of its installation, since it has a long fruit branch horizontally inclined. The difference is that in the *cordon* method there is no branch for furnishing wood; that pinching is practiced only on a few shoots, and for the purpose of regulating the vegetation, whereas, in the Guyot method, all the shoots of the fruit branch have to be pinched at the second leaf above the top bunch of grapes, in order to drive back the sap to the branch which furnishes the wood for the next pruning.

Doctor Guyot has been a leader in viticulture, and we hardly dare to criticise his method of pruning. However, we shall be allowed to make several observations, the value of which has been proved to us by experience.

Doctor Guyot recommends doing away with every shoot on the vine that does not bear fruit; we also agree that it is of great advantage to clear the plant of all suckers developed on the old wood, and to sacrifice several shoots at the base of the fruit branch, if they have no fruit on them; but we consider it superfluous labor and also injurious to suppress all the shoots on the fruit branch that do not bear fruit. This operation would be a lengthy and difficult one besides being of no real advantage. A cane does not weaken the vine unless it is bearing; if, on the contrary, it yields no grapes, the sap elaborated by its leaves strengthens its roots, augments the vigor of the vine, and helps it to resist, later on, abundant fructification.

Pinching, such as Doctor Guyot recommends, is perhaps a little too severe; we recognize its utility in maintaining equilibrium in every part of the framework of the vine, but we object to excessive mutilation. Pinching, at the second leaf above the highest cluster of fruit, will perhaps do for certain vines, but this treatment is too severe for some others. For the same reason that we leave the non-fructiferous shoots on the fruit branch, which strengthen rather than weaken the vine, we shall find that it is more rational to pinch the vegetation of the fruit branch only enough to equalize the distribution of the sap, as we have recommended in the case of young *cordons* the first year of their installation.

Let us not forget that the number of buds to be left on the fruit

branch must depend upon the vigor of the vine. If we have a vigorous subject, we may require it to yield abundantly without fearing loss of quality; but to assure its vigor, it is not necessary for us to mutilate the very organs from which its vigor is derived. Many people imagine that by severe pinching *coulure* is avoided. Our experience, as we have already said, has convinced us of the contrary.

Dr. Guyot pinches his fruit branch, in order to force the sap in abundance to the branch upon which he depends for wood for future pruning, the shoots of which do not need to be pinched. This branch, from its situation at the base of the fruit branch, is always sure of having enough sap for the proper nourishment of the two or three shoots developed on it. We prefer to have these shoots to be of very ordinary size and well directed rather than to have large wood for bearing fruit; hence we believe that a moderate pinching of the fruit branch is better than a radical pinching of all the shoots.

We would not recommend the Guyot method for very rich soil; the method used in the bottom lands, and the *cordon* methods, would be more advantageous there; but we are convinced that, properly applied, it would give excellent results in many vineyards of the *graves*, where, as we have already said, the pruning as a general thing is detestable.

CHAPTER IX.

THE CHAINTRE SYSTEM.

[N. B.—This chapter will be found in Appendix I of this report.—TRANSLATOR.]

CHAPTER X.

TRELLIS CULTURE.

There is no need to explain what is meant by a trellis. All our readers know that it is either an espalier, supported by a wall, or an arbor destined to give fruit and, at the same time, shade. Trellises are numerous in the Gironde, but they will be still more so. In the country, especially, there are few houses that cannot have this source of comfort and profit.

Unfortunately, with us, there are no rules followed in this method of culture. Free scope is given to the most fantastic imagination, and badly trained vines seldom give satisfactory results. Therefore, there is no particular method adopted in the Gironde for us to describe here. In this chapter we shall simply state what is done in other places, and tell what long experience has led us to appreciate and apply.

There is no place in France in which trellises are more renowned than Thomery, near Paris. We shall state briefly what is done there, and then make a few observations on the subject.

In Thomery the varieties chiefly cultivated are the *Chasselas doré* of Fontainebleau and the *Frankental*. The other varieties, being less in demand for consumption in Paris, are not cultivated here.

The vineyards of Thomery are covered with walls about thirty-three feet apart and about ten feet high. Each one has a little roof of plane tiles, forming a hood projecting about nine or ten inches. These walls support the trellises, the products of which constitute the wealth of this locality.

The space between the walls is occupied by counter-trellises, supported by wooden or wire lattice-work, on which the vines are trained; these counter-trellises are hardly more than three or four feet high.

To prepare for planting, the soil is cultivated to a depth of about three feet, and in strips about eight and one third feet wide. As far as possible this work is done in Summer, so as to plant in Autumn. Occasionally, however, it is done in Winter, to plant in the Spring.

In planting the vines are set out about sixteen inches apart, and a little over three feet from the wall. As soon as the canes are long enough they are brought over close to the wall by means of layering, and the next thing is to establish the *cordons*. The *cordons* are composed of two arms; generally there is a space of about eighteen inches between them, which permits of having five rows on every wall.

The walls are provided with iron wires stretched horizontally. The first wire is sixteen inches above the ground, and they are all about nine inches apart. The *cordons* are supported by the first, third, fifth, seventh, and ninth wires, and the shoots are attached to the intermediate ones.

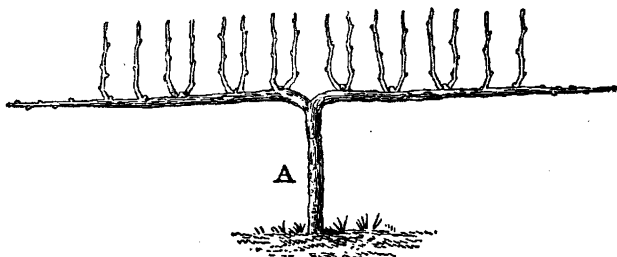


FIG. 99.

Figure 99 represents a *cordon* with two arms, trained on the wall. The stock, A, varies in length, according to the height at which the arms are established. The two arms are exactly the same length; if this were not so the longer arm would absorb the most sap, and would thus weaken the shorter. The spurs developed on these *cordons* are on the upper side, and at regular distances, that is about eight inches apart.

Every *cordon* has an extent of about six and one half feet, or a little over three feet on each side. This length is not obligatory; it is doubled, without inconvenience, if the soil is good, and the varieties vigorous, like the *Frankental*, for instance. However, we should not go beyond certain limits in the total length of the *cordons*, as is sometimes done. The tendency of the sap being principally towards the extremities, the spurs at these points would then become very vigorous to the detriment of those situated near the bifurcation of the two arms. Therefore, it is preferable to increase the number of vines in order to concentrate the action of the sap in a smaller space; for it is proved that, under these conditions, the vines yield more perfect fruit.

The same vine must not nourish a number of *cordons* one above the other. The upper *cordon* would end by absorbing all the sap, and the lowest one would be ruined.

We have stated that the usual distance between the *cordons* is about eighteen inches. As the space is to be filled up with shoots, it must be wide enough for them to acquire sufficient development, in order to maintain the vigor of the vine, without extending beyond and thus shading the next higher *cordon*. For very vigorous varieties, or in very fertile soil, this distance should be increased by four or even six inches.

When the position of the *cordons* is fully determined upon, it is marked upon the wall. First the base of each stock is indicated, and a vertical line is drawn, starting from this point. For the first vine, this vertical line goes as far as the first iron wire and stops there; for the second, to the third wire; for the third, to the fifth wire, and so on to the fifth *cordon*, which should come on the ninth wire. Then another series of lines parallel to the first is begun, and so on to the end of the wall. All that is to be done then is to mark out, at the top of each vertical line, the direction to be followed by the *cordons*, to the right and left of the verticals, and to indicate the point at which each of the *cordons* is to end; this point is easily determined, since it is exactly the middle point between two verticals of the same height.

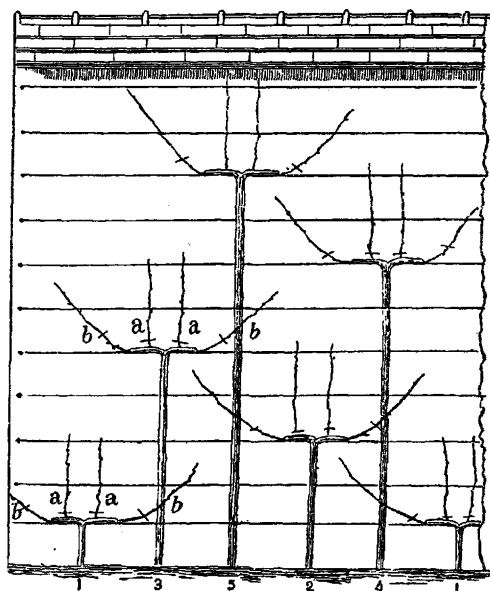


FIG. 100.

This arrangement we have just described is generally adopted in Thomery; intelligent cultivators have remarked a serious inconvenience therein. During the formation of the *cordons* the whole of one arm of every *cordon* is shadowed by the next higher *cordon*, while the opposite arm partly escapes. The result is unequal vigor in the two arms, which necessitates pinching, and even then the equi-

librium is not always maintained. Mr. Charmeux, whose trellises are so famous, has planned a combination by which he avoids this inconvenience. In his vineyard the first vine comes to the first row of *cordons*, the second comes to the third row, and the third comes to the fifth, the fourth vine comes to the second row, the fifth to the fourth, and the sixth vine recommences the series by coming to the first row, etc. (See Fig. 100.)

With this arrangement the outline is marked on the wall as easily as in the preceding form; then, too, the *cordons* do not shade each other irregularly during the first years of their formation, not until they are about five years old, and thus the principal end is attained.

After the vines have been layered, and so brought close to the wall, the canes coming up from the ground are pruned to two eyes. When vegetation begins we have two shoots from each cane, but only the one that is most vigorous and best situated is reserved, and this is supported by a little stake.



FIG. 101.

As soon as this shoot exceeds four or five buds, the height at which the *cordon* is to be established, it is pinched close to the eye that is found about two fifths or four fifths of an inch below the wire. This pinching induces the development of the side shoot, which in Thomery is designated as *entré cœur*; when it is two fifths or four fifths of an inch long, it is cut off at that point, to force the terminal eye to develop. This eye develops more or less vigorously; its wood ripens well, and eyes are developed at its base, on both the right and left sides, very close together, and well suited to form the lateral arms of the *cordon* (see Fig. 101). It is not always possible to find an eye at the exact spot we mention; but the following Autumn the earth is dug away from the foot of the vines that do not attain the height desired, and they are either buried a little deeper or raised slightly, which is very easily done, since they will need to be moved but very little.

The following Spring the cane thus prepared is cut off above the eyes at the base, at the point *a*; if it puts forth several shoots, the most suitable ones are chosen, one on each side, and the useless ones removed with the pruning knife. The two branches reserved, which are destined to form the two arms of the *cordon*, in the shape of the letter T, should be trained obliquely as long as they are herbaceous. When they have become sufficiently woody they are brought down gently to the iron wire, and attached thereto, but not too tightly, their extremities being left free.

At the next pruning each arm is topped so as to leave three eyes, taking care that the last bud reserved is found on the under side of the cane; it is preferable for the shoot that is to prolong the arm to be so situated. This terminal shoot, and the one next to it which must come from the upper side, are the only ones left this first year; all the other shoots developing near the stock are carefully suppressed.

The next year the young vines are pruned, as indicated in Figure 100; the canes *a, a*, developed on the *cordon* to two eyes in order to form spurs, and the terminal canes *b, b*, to three or four buds, always taking care that the last bud is on the under side of the cane. The prolongations are trained horizontally.

Only two shoots are allowed to develop on each of the *côts*, and only the terminal shoot, and two on the upper side, are allowed to develop on the canes that prolong the arms; all the others are suppressed.

Thus the work proceeds, the *cordon* being lengthened six or eight inches on each side every year until it meets the next *cordon*. As the arms lengthen they must be adorned with little *côts* of two eyes, about five inches apart. It is not always possible to leave the *côts* just where we would like them; they must be within the limits just mentioned.

The divers operations in Thomery during vegetation are: removing the useless shoots, cutting off the tendrils, suppressing the *entre-cœurs*, pinching, training, retraining, and cutting off some of the berries and leaves.

The first operation is performed when the herbaceous canes, that is, the young shoots, are about five inches long. Those that appear weak and those that have no fruit, are removed with the fingers. The suppression must not be too general, however, and even if there would be no fruit on them, one or two shoots must be reserved on every spur. On the canes that prolong the arms, the feeble shoots are suppressed; one vigorous shoot is left to prolong the arm, and one or two are left on the upper side to form new spurs. The removal of tendrils, suppression of the *entre-cœurs*, and pinching, are usually effected fifteen days after the removal of the shoots. These operations consist in ridding the vines of the tendrils (*b*, Fig. 102) that are close to the shoots, as well as those on the fruit; in suppressing, or pinching at the first leaf, the *entre-cœurs* (*a*, Fig. 102); and in topping the extremities of all the shoots that extend beyond the *cordon* immediately above.

Training is proceeded with about ten or twelve days later. This work consists in attaching every shoot separately to the wires, spreading them apart in such a manner as to cover the wall, while avoiding all confusion. The terminal shoot, having to serve as the prolongation of the arms, is trained obliquely; all the others vertically, or almost so. *Retraining* consists simply in training the backward shoots that had not reached the wire when the others were trained. They are pinched at the same time.



FIG. 102.

The next operation consists in removing some of the berries when the latter are about the size of a pea; with sharp scissors the smallest berries are cut out of the bunch when the latter is not too crowded:

when, on the contrary, there are too many berries in the bunch, not only the small ones, but a fourth, and sometimes a third of the large ones, are removed. This benefits the remaining berries, which increase in size and ripen sooner. Sometimes the grapes are not only thinned out, but, in young vines, very often about an inch of the clusters of fruit is cut off, if the latter are too long.

The removal of leaves is effected at various times; those that are in the way or badly developed, called in Thomery *feuilles frisées*, are taken off. When thinning the grapes many leaves in the interior of the vines are removed, and finally, when the fruit is ripe, it is partially uncovered, taking care to cut and not to pull off the leaf stalk. If the grapes were exposed too suddenly they might be injured by the sun, as the heat is still intense at that season. It is not until about the first of October that all the leaves are stripped off, so as to subject the fruit to the influence of the sun, dew, and fog, which adds much to its fine coloring.

This method of trellis culture used in Thomery, which we have just described, is evidently a good one; but it is not very easy to apply. It demands, in order to maintain the equilibrium of the vines, an amount of supervision and care that is seldom obtained from viticulturists, especially hired laborers.

We, ourselves, have undertaken trellis culture in the Gironde, and the method we have adopted has been sufficiently satisfactory in its excellent results for us to recommend it to our readers.

This method is simply the unilateral *cordon* applied to trellis culture. Figures 103, 104, and 105 illustrate our trellises and give an idea of the method. All the sap being conveyed to one arm, we have no fear, as in the *cordons* of Thomery, of one part of the vine developing to the detriment of the other, and, moreover, the whole surface of the wall is covered with perfect regularity.

The vine being more vigorous in our region than in the environs of Paris, we advise allowing a space of two feet, instead of eighteen inches, between the *cordons*. As for the space between the vines, it depends upon the number of *cordons* desired for a wall. If the height of the wall allows for only three rows of *cordons*, one above the other, as in Figure 103, the vines may be planted about three feet apart. If, as in Figure 104, there is space enough for four rows of *cordons*, the vines should be about two and a half feet apart. If the wall is high enough for five rows, as in Figure 105, the space between the vines should be two feet. We should state, however, that in the same sort of soil the trellis of Figure 105 will exhaust the soil sooner than that of Figure 103, and, consequently, it will be necessary to fertilize oftener.

The method of planting used in Thomery seems to us to be an excellent one, and we cannot but recommend it. The vines illustrated in Figures 103, 104, and 105, were not planted by us. We did not

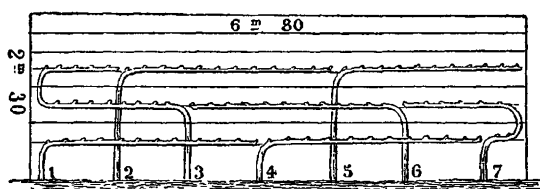


FIG. 103.

take them in hand until six years ago, when they were three years old. This fact explains the irregularity in the planting. The *cordons* are now completely formed; they keep in perfect condition, and yield a quantity of excellent Chasselas. Nos. 1 and 6 of Figure 105 have

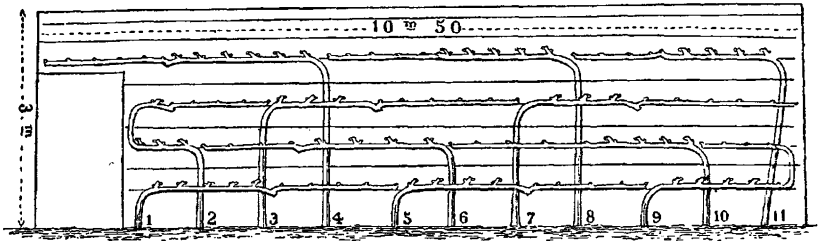


FIG. 104.

developed somewhat to excess; nevertheless, they keep in excellent condition, which shows how far apart the vines may be planted. We have used this method for a great many trellises, arbors included. The three illustrations we give here (Figures 103, 104, and 105) were taken from walls of different heights, so as to demonstrate our method more clearly.

In our trellises the iron wires are about one and three fifths or two inches from the wall, and we train the vertical canes up between the wall and the wires. As is customary in Thomery, we outline the position of the *cordons* on the wall, or else we draw an exact plan which we keep before us so as to follow it scrupulously in pruning and training. When there are to be three rows of *cordons* on a wall (Fig. 103); the first vine on the left begins the lowest row of *cordons*, being trained along the bottom wire and extending as far as the fourth vine; the fourth vine extends along the same wire as far as the seventh vine,

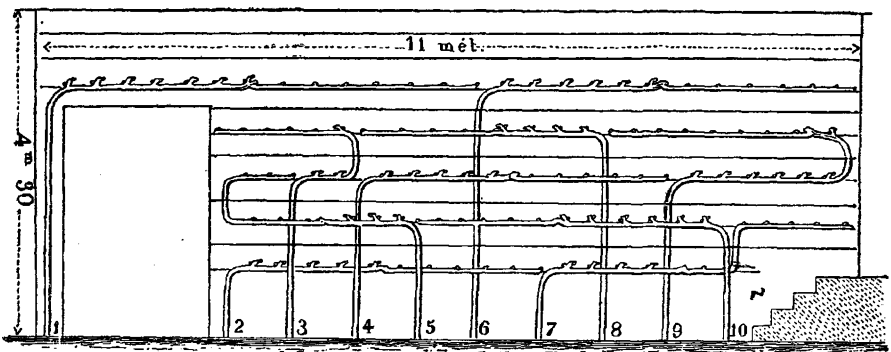


FIG. 105.

and so on, taking every third vine to form the bottom row of *cordons* and leaving the intermediate ones for the upper rows. The seventh vine extends to the end of the wall, ascends to the next row, and goes back in the opposite direction to that taken by the lower row of *cordons*, until it meets the sixth vine; the latter, in its turn, extends back to the third; the third comes to the end of the wall, ascends to

the next row, and follows along the wire until it meets the second vine; the second and fifth complete the espalier.

If the wall allows for four rows of *cordons*, the principle is the same. Figure 104 shows us a trellis formed under these conditions. Vine No. 1 begins the lowest row of *cordons*, and extends to the fifth vine, leaving three intermediate vines to form *cordons* for the next three rows; vine No. 9 comes to the end of the wall, ascends to the second row and turns back, extending to vine No. 10, which goes on in the same direction until it meets No. 6. Figure 104 shows this arrangement better than we can describe it in words.

Figure 105 shows a wall having five rows of *cordons*, trained according to the same principles. A great empty space on the left side, as well as a flight of steps at the extremity on the right, rendered the establishment of the *cordons* more difficult; but, as may be seen, the obstacle has been surmounted. A wall can always be covered, no matter how irregular the surface, by the method in question.

Sometimes our *cordons* are formed in a single year, generally in two; sometimes the upper rows are not completed before the third year.

These *cordons* on trellises are established exactly according to the same principles as those already given for the *cordons* method in Chapter VII. In forming them the vertical canes must be passed up between the wall and the iron wires; they are kept straight by means of little stakes, up to the point at which they are to take the horizontal direction; this prop, placed on the side opposite the bend, facilitates the formation of the latter.

As soon as the *cordons* are established the superfluous eyes must be removed; all those from the base of the vine to ten inches beyond the bend are suppressed; from this point on all those on the under side are suppressed. If the *cordons* has not attained the required length, the shoot that is to prolong it is left on the under side, so that the prolongation will be straight. When a *cordons* ascends from its row to the next higher, to be trained along the latter, all the eyes on the vertical part between must be suppressed. The first eye on the upper part should not be less than ten inches from the bend.

All along the *cordons* there should be *côts* or spurs pruned to two eyes, and about six or eight inches apart; when pruning, the year after the formation of the *cordons*, the greatest care should be given to establishing the *côts* at this distance from each other.

When the *cordons* are once established and adorned with spurs, there is nothing to do but to prune them regularly. This pruning is entirely elementary—the lowest shoot developed on the wood of the preceding year is pruned to two eyes; if, however, this shoot should be too slender, or faulty in its direction, a higher one would be taken.

When, after many years pruning, the spurs become too long, a shoot at their base, such as *A* (Fig. 106, or one a little higher, such as *B*), is reserved. The cane produced by this young shoot is pruned, the first year, to one eye, the old spur being preserved. The development of the shoot coming from this eye is favored by pinching the two shoots of the main spur, *c, c*, a little more severely. The next year the old *côt* is cut back close to the little *côt*, which then furnishes the wood for future pruning.

When the shoots are well developed all those coming from the old wood are cut off, only those being spared that are well situated for

the establishment of an *œil de retour*, in case one should be wanted to take the place of the spur, if the latter becomes too long.

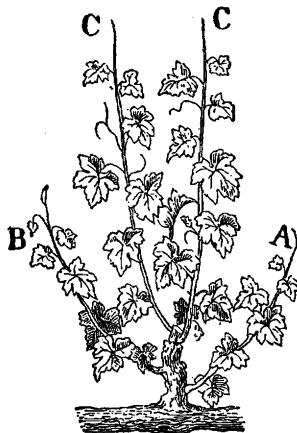


FIG. 106.

The shoots must be trained up on the wires as far as possible, one by one, without injuring the fruit. All the shoots, excepting those destined to prolong the *cordons*, should be pinched when they reach the *cordon* above; hence the trellises must be inspected from time to time, to train and pinch the shoots whose development necessitates so doing.

The rules to be followed in forming the counter-trellises and arbors are the same as those for training the *cordons* along the walls. We have stated that the counter-trellises are supported by a wooden or wire lattice instead of a wall. An arbor should be considered as two counter-trellises, separated at the base and uniting at the top.

We cannot leave the subject of pruning without speaking of the instruments used in its execution. In the Gironde, excepting in a large part of Médoc, where the pruning-knife is used almost entirely, the work is always done with shears.

We prefer work carefully executed with this instrument to that done with the knife. The latter may be more expeditious, but the workmen maltreat the vines more with it than with shears.

Since in many localities these instruments are not all that can be desired, in the interest of our readers we will recommend very particularly the excellent shears manufactured by M. Cluchet, *rue des Remparts, 52, à Bordeaux*.

SECOND ANNUAL REPORT
OF THE
CHIEF EXECUTIVE VITICULTURAL OFFICER
TO THE
BOARD OF STATE VITICULTURAL COMMISSIONERS,
FOR THE YEAR 1882-3.

OFFICE: 111 Leidesdorff Street, San Francisco, Cal.

APPENDIX III. Different Methods of Grafting the Vine.



SACRAMENTO:
STATE OFFICE.....JAMES J. AYERS, SUPT. STATE PRINTING.
1883.

PREFACE.

One of the most important studies for our vine-growers is now and will continue to be that of grafting. The necessity of knowing all that we may learn in this branch of viticulture, besides making new experiments, must be obvious to all who reflect upon two features of our industrial development, viz.:

First—The advantages to be obtained by grafting vines of inferior quality with scions of nobler varieties.

Second—The reconstitution of vineyards attacked by phylloxera, by planting resistant vines, which must be grafted with our noblest varieties.

In a few years there will be thousands of acres grafted annually; but the greatest difficulty is the want of special knowledge and experience. Many vine-growers imagine that grafting is a risky business. Permit me to assure them, not theoretically, but after practical observation and experience, that nothing is more simple and safe in our industry. It needs, however, theoretical knowledge and strict rules to insure success. Each proprietor should master the principles and become able to instruct his workmen. I intend in my regular report (these appendices are in advance of the report they are to accompany) to discuss this subject from practical experience, and to suggest some improvements on the methods discussed in the translations herewith presented to the public. Our industrious Secretary, Mr. John H. Wheeler, has translated the important parts of a work recently published in France, by Aimé Champin, author of the Champin graft, which are considered by us as typical studies for those who desire to experiment with grafting. We shall, however, confine ourselves to a few methods, when we are ready to give our recommendations. I have some experiments now being proved, of which I shall write fully in my report, viz.: such as grafts made successfully in the month of August on vines of different species, etc.

Grafting the vine is practically a new study, and we may, with this work well digested, go forward on even terms with our friends in France. In this we have not, as in fermentation, etc., the arrears of generations to overcome.

To illustrate the possibilities of this new feature in viticulture, I will only at this time say that I expect to show by my experiments made this year that the best time to graft young vines is in the month of August and in the latter part of October, certain exceptions being made as to the August grafts where very severe and early Fall frosts are to be feared. I have had occasion to show a peculiar value in Fall grafting lately, when recommending to a gentleman who has recently imported some Huascar cuttings from Chili, to preserve them most efficaciously by grafting at once on old vines; it being known, of course, that cuttings of vines from the southern hemisphere arrive here during our period of vegetation.

The caution I wish to insist upon is that, while reading of so many different and curious methods of grafting, the student should not become enthusiastic over any fascinating invention unless the same has been practically demonstrated in the field. There are few methods, however, that may not have at some time an easy application of great importance, and all should be understood thoroughly.

CHAS. A. WETMORE,
Chief Executive Viticultural Officer.

SAN FRANCISCO, October 21, 1883.

VINE GRAFTING,

By AIMÉ CHAMPIN,

Propriétaire Viticulteur, Membre du Conseil général de la Drôme, Président du Comité d'études et de Vigilance
de Montélimar, Membre de la Société des Agriculteurs de France, etc.

(EXTRACTS TRANSLATED.)

JOHN H. WHEELER, SECRETARY OF THE BOARD OF STATE
VITICULTURAL COMMISSIONERS, TRANSLATOR.

I.—GRAFTING BY APPROACH.

Grafting by approach may be either above or below ground, each of which will be considered separately.

A.—GRAFTING ABOVE GROUND BY APPROACH.

There are many methods of forming the union between the graft and subject above ground; many, too, are simple and lead to an easy success; they require, however, one precaution not necessary with grafting of other fruits, viz.: that of having the point of union below the surface of the soil. The graft by approach is the only system which will succeed in the open air above the soil. It is not known why the vine, like other plants, cannot be grafted above ground, but it is thought, in explanation, that the proper wax or sealing material for the operation has not been found, and it is suggested that we may at some time be able to employ the many other systems of grafting besides that by approach when the proper wax be found to bind the parts together. With the graft by approach no difficulty is encountered.

This method is divided, according to the subject and graft or scion used, as follows:

1.—OLD EUROPEAN VINE AND SCION OF A YOUNG RESISTANT VARIETY.

The end to be obtained here is the substitution of a resistant vine for a non-resistant vine—the converting it into one which may be attacked but not destroyed—and thus utilize the infested vine so far as practicable. To do this, plant the subject or vine to be grafted near each of the infested vines at a distance varying from ten to twenty inches or more, according to the distance apart of the old vines. The subject so planted may be a rooted vine, seedling, or even a cutting.

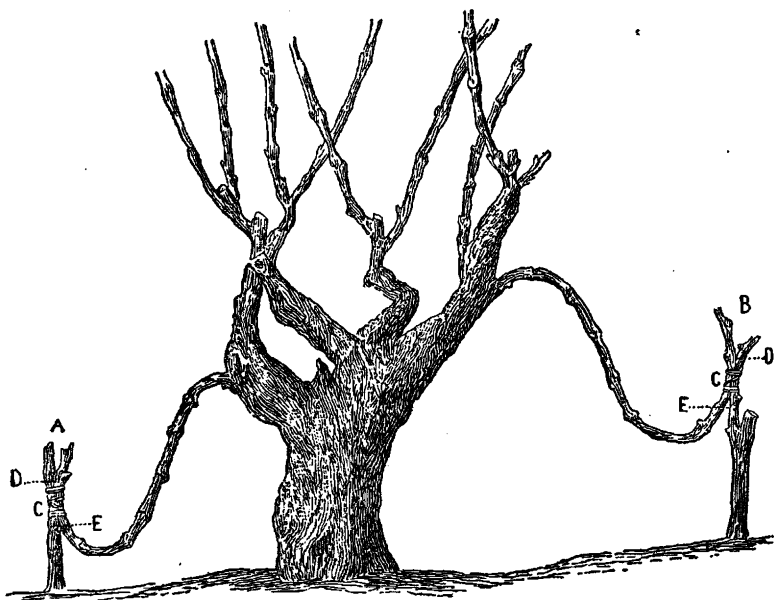


FIG. 1.

At the time of planting (Figure 1, *A*), or the year after (Figure 1, *B*), a branch from the infested vine is bent over to the resistant stock in such a manner as to render the two in parallel contact throughout two or three inches, at which point of contact the grafting is performed (Figure 1, *C, C*).

To do this, it is sufficient to lay bare the wood of the two adjoining surfaces for from one to two inches in length, and then bind them close, in such a manner as to bring about a complete adherence of the two bare surfaces; after this, wax must be applied to exclude the air entirely from the interstices, or cracks, formed between the two parts where the contact may not be perfect.



FIG. 2.



FIG. 3.

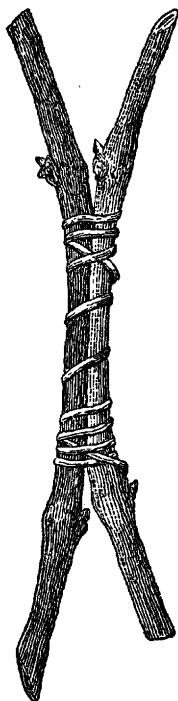


FIG. 4.

The Figures 2, 3, and 4 make plain the practice of putting the parts in shape.

The union will not be slow in forming, and the graft is certain to take if the operation is well performed and the two surfaces be in proper contact. Each plant now sends forth shoots from the buds above the graft or point of union, perhaps one, perhaps more. At this time the desired stock is encouraged by pinching off and retarding the growth of sprouts growing from the resistant vine. The graft must now be carefully examined to see that the tie, or cord, may not strangle the new growth; if growing too tight, it should be removed and replaced properly. As to the suppression of the undesirable stock, this may be done when the union becomes so fixed as to resist the twisting or shock of the wind.

When assured that the sap is circulating in the proper channel and the joint is becoming fixed, the operator may proceed to cut off the upper part of the resistant vine, smooth and entire, at the point *D*, Figure 1. When the union is complete, and not until then, can the connection with the infested or non-resistant vine be severed at *E*, Figure 1, underneath the union. If not severed now, the vine will

develop beyond the union in a manner disproportionate with the small root, and, further, draw off to itself a portion of the returning sap, which should go to develop the new branches.

2.—GRAFTING ABOVE GROUND BY APPROACH OF HERBACEOUS SHOOTS BETWEEN AN OLD EUROPEAN VINE AND A YOUNG RESISTANT VARIETY.

When the grafting method, just described, becomes impracticable or fails to answer—perhaps owing to a press of time at the grafting season, which is in Spring; perhaps the graft made has not united or been successful; still further it may be the herbaceous or green graft is preferable—the following method may then be adopted: bring the green and growing branch of the European vine and that of the resistant vine together, and unite them in the same manner as already shown in Figure 1, *B*, Figures 2, 3, 4.

The operation here is a delicate one, requiring a skillful hand and a gentle force in tying. Wax here becomes useless, as the sap at this season is sufficiently abundant to close all joints or openings and form a union without fear of contact with air. The same precautions are observed in making this graft as in the one described before, with additional care as to the tie which might otherwise strangle the vine, break the twig or graft when joined. The earlier this graft can be made the better, as by so doing the union has more time to connect and solidify.

The month of June is the most favorable month for this system of grafting; in midsummer a good union is obtained, and throughout the hottest period, even to the end of July or later. It is not prudent to put it off till late, especially in the north, in which regions it becomes impracticable in all but during a short time. It is essential that the branches be large and strong in order that the graft may connect and solidify before Winter.

These methods of grafting above ground offer three advantages, viz.: an almost absolute certainty of the grafts "taking;" the avoidance of all chance of the plant becoming free from the grafting stock; and finally the possibility of preserving the vineyard with its uninterrupted profits up to the last, even till all infected or susceptible vines shall have disappeared,—a process which enables the new and grafted plantation to supply the deficit of the old in just the proportion in which the latter declines.

But aside from these advantages there arise sundry inconveniences. Though the graft by approach be easy in itself; though it be easy to prepare and place together the two pieces of cane which require intimate contact, yet it is not always easy, as one would suppose, to find canes of the proper size; it requires time, repeated trials, and then we often fail to find the right one. Finally it becomes necessary, as the diseased vines die, to grub them out and to uproot and remove as much as possible the diseased parts; this deranges and injures the roots of the young and resistant vines.

A still more serious injury arises from the evil infection of the soil already supporting diseased vines and the previous exhaustion of the same soil by the old plant. The soil might be reinforced with fertilizers, it is true, but this would not avoid the injury done the young plant by disease contracted from the old and rotten roots of its predecessor. All of the parasites developed on the old roots proceed to the new vine, and, although the American vine is ultimately

resistant, still the attacks of injurious parasites should, as much as possible, be kept off from the young plant while in its first growth and while starting, and it should have all aid and nourishment possible.

Thus we find corresponding evils to set off the advantage of the system, and it is only where the infected vines are young and newly diseased that the advantages arising by this method more than compensate for the evils incurred in the use of it.

In view of the difficulty of uniting a detached scion to the vine, some vigneron, in order to make use of the approach system, have conceived the idea of planting two vines, resistant and desired stock, together, and uniting them above ground by either the herbaceous or lignified canes.

As there exist a number of methods of uniting the two vines above mentioned which may be of use, they will be given to avoid useless repetition further on when desiring to refer to them.

3.—HERBACEOUS GRAFTING ABOVE GROUND BY APPROACH—NON-RESISTANT ON RESISTANT CUTTINGS.

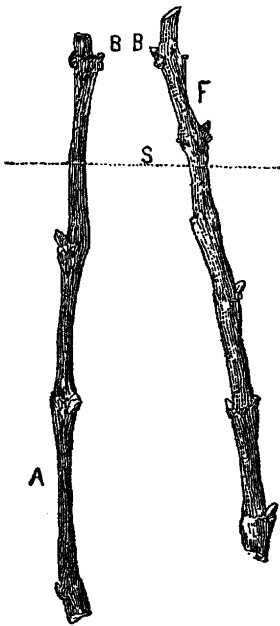


FIG. 5.

The cuttings, one resistant and one European, should be planted together, occupying the position of a single vine as planted by the ordinary methods. Care is needed in putting the bud that is to develop the grafting cane opposite that to be grafted—both on the near sides of the cuttings, as represented in Figure 5.

When the two canes develop enough to permit of operating upon them, they are bound together after having pared off the bark and some of the green wood of each. Care must then be taken to keep the union firm and not strangle it; to pinch back the shoot from the resistant one and encourage the other, and finally to completely sever the European vine beneath the point of grafting from its own root.

4.—HERBACEOUS GRAFT BY APPROACH ABOVE GROUND BETWEEN TWO ROOTED VINES, RESISTANT AND NON-RESISTANT.

As the resistant vines, notably the American varieties, are more vigorous and grow more rapidly than the European or other non-resistant varieties, a disproportion may arise between the two plants, which will make it impossible or impracticable to unite them; this, with the chance of both cuttings not growing, argues strongly in favor of planting rooted vines instead of cuttings, which thus assures the success of the graft. The operation is illustrated in Figure 6, in which graft No. 3, given before, is used.

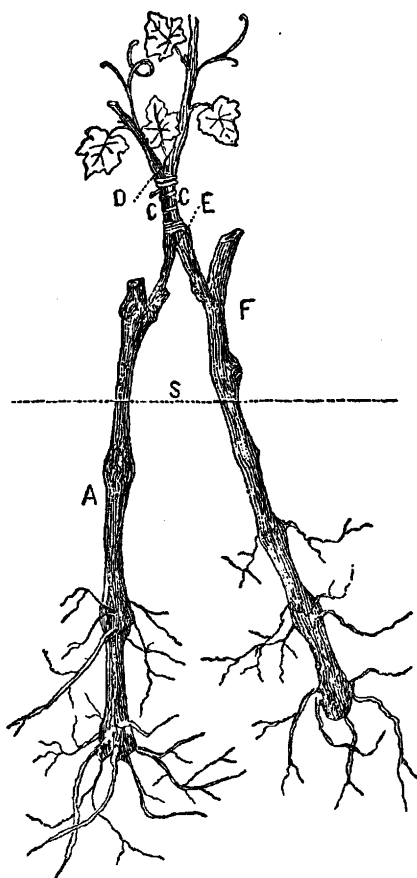


FIG. 6.

5.—HERBACEOUS GRAFTING ABOVE GROUND BY APPROACH—ROOTED NON-RESISTANT ON RESISTANT CUTTINGS.

This is often resorted to, to overcome the difference in growth which arises between the rooted vines of the resistant and non-resistant varieties, and for this purpose succeeds admirably. The European variety may be planted in the usual manner to insure its proper development before another season; then, in the following season, the American cutting is inserted at its side in such a manner that the shoot proceeding from it, which grows so luxuriantly, may form a subject on to which the vine already one year old may be grafted, in place. Even a rooted resistant variety may be planted instead of a cutting, its growth being sufficiently retarded by the transplanting to produce uniformity.

6.—WOODY GRAFT ABOVE GROUND BY APPROACH BETWEEN YOUNG VINES,
RESISTANT AND NON-RESISTANT, IN PLACE.

Where unable, for any reason, to unite the vines, resistant and non-resistant, the first year, the union of the lignified wood may be made by grafting the canes from the two in place, the operation being performed in the following Spring in the same manner as with herbaceous shoots illustrated in Figure 6.

7.—WOODY GRAFTING ABOVE GROUND BY APPROACH OF ROOTED VINES
BEFORE PLANTING.

The greatest obstacle to the herbaceous graft is that it must be done in a certain place and time—the beginning of Summer, as to time. In the following we are enabled to avoid these difficulties:

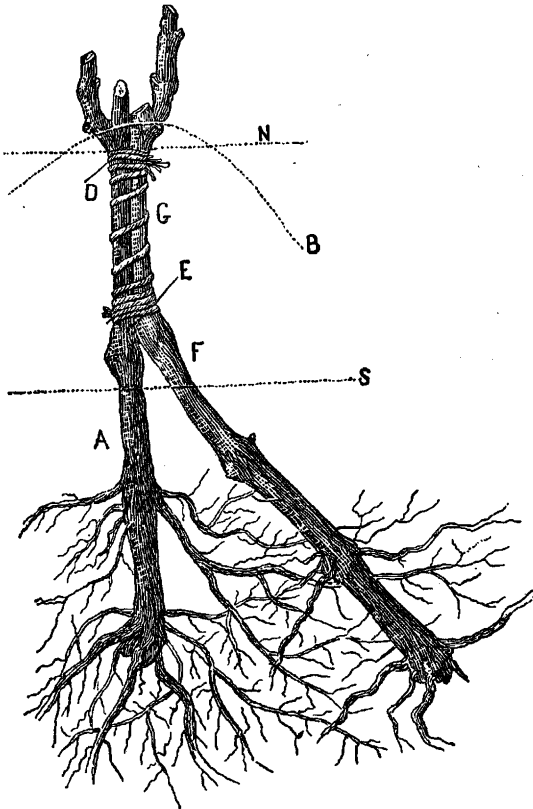


FIG. 7.

The two plants to be united are taken to a suitable and convenient place, convenient for the operator. Then, in grafting, the most favorable point for the union to be effected can be chosen at will, may be two surfaces of the old and original stalks, as in Figure 7; may be an old stalk of one and a new growth on the other; or it

may be the new growth of the two, as seen in Figure 8. The vines are cut and prepared, adjusted, tied, and waxed, and in planting care should be taken in maintaining the point of union, *G*, a little above the soil, Figures 7, 8, 9, 10, *S*, representing the surface of the soil. Further, the resistant vine should be set in the desired place, *A* (Figures 7, 8, 9, 10); that it be maintained straight and erect, curving the non-resistant vine, *F* (Figures 7, 8, 9, 10), if necessary, in order that the roots may be so arranged as to be easily removed when severed from the other plant.

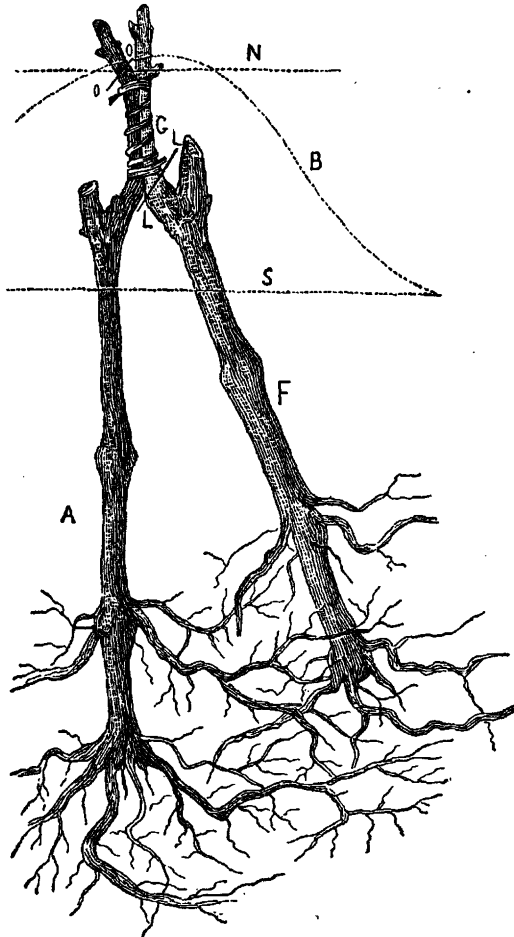


FIG. 8.

8.—WOODY GRAFTING ABOVE GROUND BY APPROACH OF CUTTINGS ON CUTTINGS, PREVIOUS TO PLANTING.

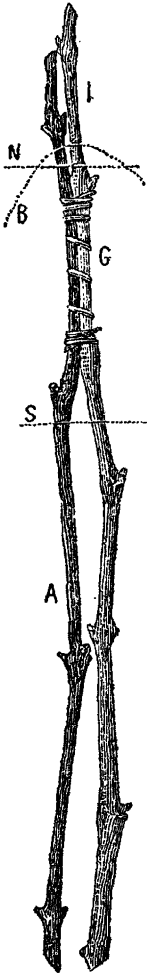


FIG. 9.

Cuttings have the advantage of being more supple, and accordingly presenting a greater number of sides or surfaces to choose from; further, by the use of cuttings a year's time may be gained in the planting over putting them in nursery. It may happen here that one of the cuttings—the two of which in this case form both subject and graft—takes root and the other does not. So much the better if it happens to be the right one, as this would do away with the necessity of removing the roots of the non-resistant vine, this being the one which does not root. If, on the other hand, it be reversed, and the wrong cutting takes root, which, however, is rarely the case, then the planting of the resistant variety will have to be repeated.

9.—WOODY GRAFT ABOVE GROUND, BY APPROACH BETWEEN A ROOTED RESISTANT VINE AND A NON-RESISTANT CUTTING, BEFORE PLANTING.

This system, borrowed in part from the preceding, has for its first advantage that of employing a non-resistant cutting, which is easily and quickly procured, instead of being bothered with a rooted vine (Fig. 10). It possesses the advantage over the graft of cutting to cutting,—which surpasses it in simplicity,—of furnishing sap to the graft more abundantly than could a simple cutting.

10.—WOODY GRAFTING ABOVE GROUND BY APPROACH BETWEEN A NON-RESISTANT CUTTING AND A RESISTANT VINE ROOTED AND IN PLACE.

This system is given for utilizing whatever resistant vines which may be retained in place; and for the purpose of grafting those resistant vines on which the graft, set perhaps in the same year, owing to one cause or another, did not take. Grafting can usually be kept up later than is generally supposed—when done by approach any time will do—from midsummer to the end of Summer, thus enabling one to operate again on those which did not succeed in Spring. This graft differs from the preceding only in that the vine grafted is in place, and the earth must be moved at its roots to permit of planting the graft by its side, the hole to be then carefully filled.

After the union is effected all are treated alike, the only difficulty being, that common to the other grafts, of removing all of the roots

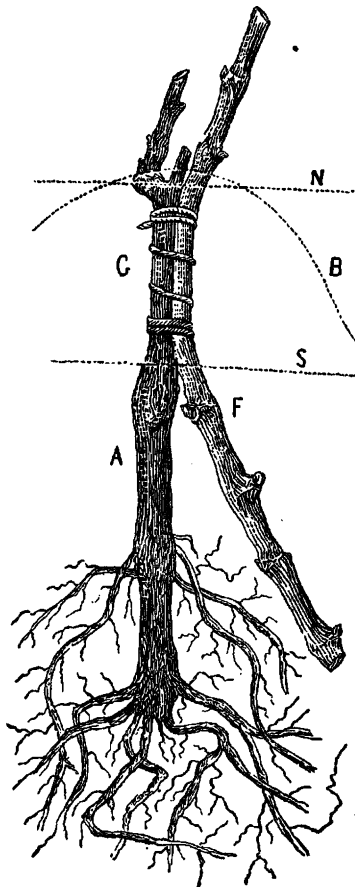


FIG. 10.

of the non-resistant vine. When the graft and plant have become firmly united, the sooner the roots can be separated the better, for even at the soonest, considerable damage results to the resistant vine in separating the roots. When the grafting can be done in the nursery, especially if done by inexperienced hands, the vineyard may be planted with growing resistant vines and the roots disturbed but once.

11.—GRAFT BY APPROACH WITH INCISION AND LANGUETTE, OR ENGLISH LATERAL GRAFT.



FIG. 11.

This consists of a simple modification of the ordinary graft by approach in its simplest form. The principle may be applied to all of the systems heretofore explained and to a large number of those to follow.

In place of simply laying on the two surfaces alone, an incision is made in each, as seen in the cut, one third down from the bud, *A* (Fig. 11), in one, and two thirds down from the bud, and the incision upwards on the other, *A* (Fig. 12). The depth of the incision should be about equal to one third of the surface laid bare. When prepared, as above, the tongue of one is inserted in the incision formed in the other in such a manner as to cover all wood laid bare by that of the corresponding part on the other cutting; then bind and wax up as in other grafts. (Fig. 13.)

This system claims the advantage of presenting a more extended surface to bring in contact, and thus facilitate the circulation of sap between them, and also to fix the joint more firmly and rapidly. As regards its value and practicability, it may be said that this system, applied to the free graft, is valuable, but in joining the parts as above, laterally, the union is always incomplete and the graft very difficult to make.

Before leaving the "above ground" work, which is not very common on the whole, it may be of interest to know of a very ingenious plan practiced by a certain viticulturist of l'Ardiche.

This vigneron raised both resistant and non-resistant vines in numerous pots, which same could be placed in the nursery, hot-house, or elsewhere, not interfering with other culture; then, when required, the same vines were readily transplanted from the pots and united.



FIG. 12.

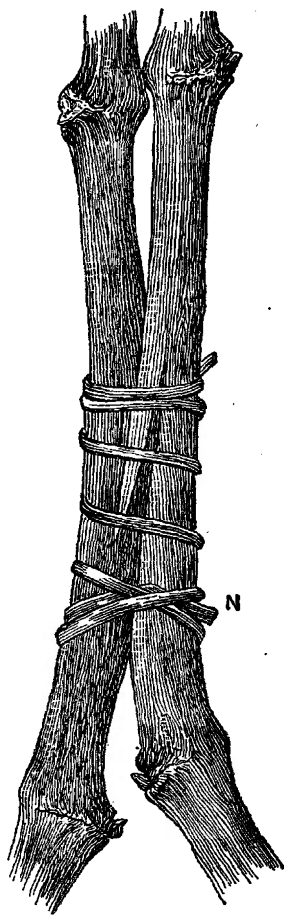


FIG. 13.

B.—GRAFTING BELOW GROUND BY APPROACH.

Although so numerous, some vigneronns have practiced all of the methods of grafting contained in this publication, and also, to make the list complete, the following systems, which must therefore be included. Some, as may be seen, are sufficiently explained by the cuts or figures presented and require no further description.

12.—GRAFTING BELOW GROUND BY APPROACH OF A RESISTANT CUTTING ON AN OLD NON-RESISTANT VINE.

This method is employed to utilize the remaining vigor of an old non-resistant vine, by transferring its remaining vitality to the young resistant vine at its side; the method has been and continues to be frequently used.

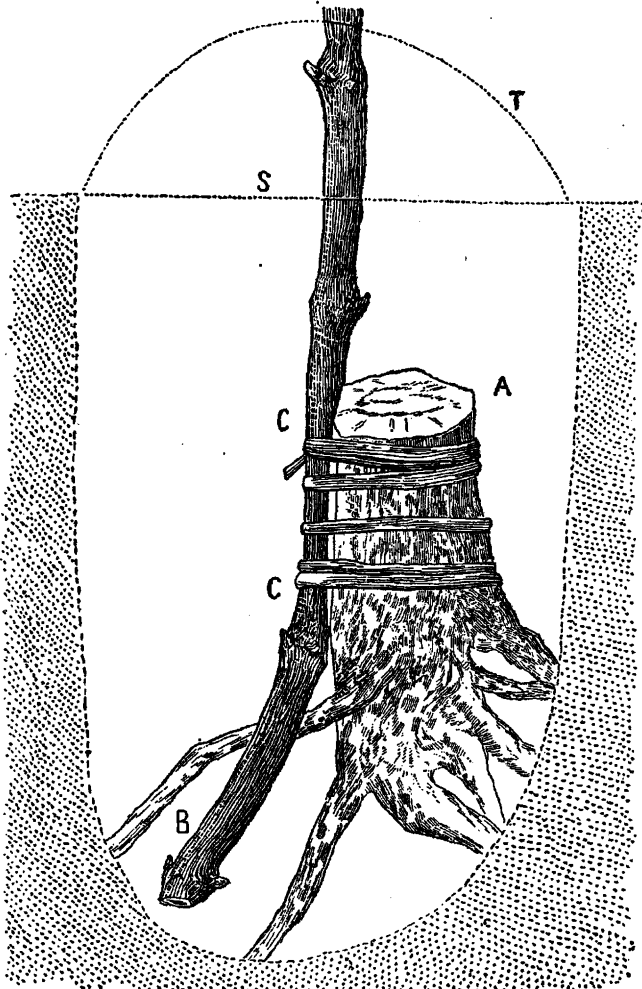


FIG. 14.

A smooth woody surface is prepared on the side of the old vine, which has been cut off deep down, and a corresponding surface formed on the cutting, as seen in Figure 14; the point of union coming well below the surface of the ground, *A* (Figure 14), the contact should extend through several inches, *C C*, and the cutting extend deep enough to retain one or two buds below the point of union. If, however, the point of union be far enough below the surface to permit of roots forming successfully at or about the joint, then this latter precaution may be overlooked. After carefully adjusting the two prepared surfaces, the whole is bound and the joint cemented with a little clay, after which the loose earth is heaped up over the graft, as indicated by *T* (Fig. 14). (1)

As a means of rapid multiplication this proceeding is a good one, if desirous of using the resistant plants so formed elsewhere, or even there, when the old vine is not diseased; but if diseased, and one desires to establish a new resistant vine in the place of a non-resistant diseased vine, its objections are immediately apparent. As a still further objection, it may be said that under the influence of the old vine root the young graft is developed in a marked disproportion to the development of its resistant root system; then when the phylloxera completely destroys the old roots the new vine roots are not sufficient to keep up the new branch system, not yet having penetrated to a sufficient depth.

In this graft the cutting becomes an accessory plant. As indicated in the title, this operation is applicable to the fixing of a resistant on a non-resistant vine. It is further applicable to the fixing of a resistant on a resistant root, but never to the fixing of a non-resistant on a resistant, for the taking root of the graft is only the adverse of what is desired.

13.—GRAFTING BELOW GROUND BY APPROACH, BETWEEN A ROOTED RESISTANT VINE AND A ROOTED NON-RESISTANT VINE. (FIGS. 7 AND 8.)

14.—GRAFTING BELOW GROUND BY APPROACH, BETWEEN A CUTTING AND A NON-RESISTANT ROOTED VINE. (FIG. 10.)

15.—GRAFTING BELOW GROUND BY APPROACH, BETWEEN CUTTING AND CUTTING. (FIG. 9.)

These three systems of grafting, the work of which may be done before planting, differ from the same above ground only in one particular, viz.: that the point of union, *G* (Figs. 7, 8, 9, 10), is placed below ground (dotted line *N*) when planting, instead of above (dotted line *S*); a difference, however, which is sufficient to deprive them of the greatest advantage of the above-ground graft, inasmuch as the former is apt to root both plants independently, and to free the non-resistant vine to its own resources and subsequent weaknesses.

By the adoption of a simple device, the advantages of this system may be utilized to good effect by placing the point of union at or below the surface of the soil and then covering up the vine for a few inches (dotted line *B*) by piling up the earth against the same. This protects the graft and may be removed at pleasure.

(1) The representations surrounding Figure 14 apply as well to Figures 16, 21, 22, 31, 34, 35, 36, and even in certain cases, to Figures 23, 24, 32, 33, 64, when they represent grafts made beneath the surface.

16.—LALIMAN'S GRAFT BETWEEN CUTTINGS WOUND ABOUT EACH OTHER.

Mr. Laliman, of France, an indefatigable promoter of viticulture, and especially of the American vine, claims to be the inventor of this graft, which is at once simple, ingenious, and sure to "take." It has been adopted on a large scale by some prominent viticulturists, and appears to produce excellent results.

The resistant and non-resistant cuttings are wound about each other, thus obtaining a continuous contact of the two, or at least, in enough places to assure the union being formed. (Fig. 15.) The double cutting is then planted, which puts forth alternately canes of resistant and of non-resistant stock; also the same of alternating roots. The canes desired are easily distinguished, and those not desired pruned out. With the roots, however, the phylloxera alone can determine them, and to the insect this must be left.

Some viticulturists have adopted, practiced, and recommended this system, and it is certainly an ingenious contrivance for assuring the union of the two plants. They are united certainly at two points, and finally grow together throughout, forming, ultimately, a vine half resistant and half non-resistant. The question arises, is this sufficient to withstand the attacks of the phylloxera? This must be answered by experience, and by experience alone. It may be well believed that in this, as in others, where a part of the root system is susceptible, it will fail just when the vine is developing itself with the dependence on all of its roots, and thereby bring about an improper and evil disproportion between roots and top so hurtful to the plant.



FIG. 15.

II.—CLEFT GRAFTING (EN FENTE).

The ordinary cleft grafting and notch grafting, with their various modifications, have long and commonly been resorted to when desirable to change the stock or production of a vine, or for any other purpose; its use grew out of the necessity of replacing poor stocks, etc., and is common to all vigneron.

17.—SIMPLE LATERAL CLEFT GRAFTING.

The vine is first laid bare down to the lateral roots, and then cut off horizontally two inches or more above them. With a grafting knife sufficiently strong to bear hammering with a mallet, a slit or cleft is cut in one of the sides, pointing to the center and deep down on the outer side. (Fig. 16.)

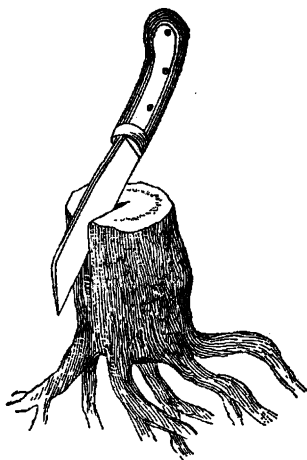


FIG. 16.

A graft, or scion, is then selected, long enough to permit of at least one eye being above ground. This is then cut converging for a length of from one to two inches or more at its lower end, so as to fit the notch cut in the growing vine. (Fig. 17.)

To make this fit, the scion should be beveled to allow of the woody surfaces coming together completely, as seen in Figure 18, too much



FIG. 17.

being better than not enough, for it is on the exterior surface that the union must be complete.

The transverse sections shown in Figures 19 and 20 exhibit the two methods of doing this—one wrong, *A*; and the other right, *B*. Anything like *A* should be carefully avoided.

To place the scion properly in the slit, it may be opened with the knife, pressing the same over to one side and withdrawing it when the point of the scion has been inserted; some use a wedge-shaped piece of wood, which serves to open the crack, and the scion is quickly inserted, when the wedge is withdrawn. (*C*, Fig. 21.)

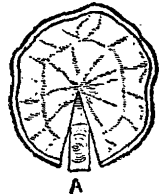
The graft is here so well protected by the stump that it usually needs no tying to keep it in place, especially when the slit does not traverse the whole stump, as in this case the pressure of the wood on both sides is sufficient to keep it in place. It is always necessary, however, to wax the joint well, to stop up all cracks, and to cover over all surfaces left exposed by the knife or saw, after which the earth should be carefully heaped up over the joint thus made.

18.—SIMPLE TRANSVERSAL CLEFT GRAFTING.

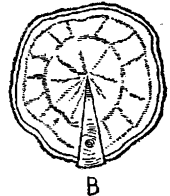
If the root be wide enough to permit, it is often desirable to put two scions into one stump, which is done by cutting or splitting into the stump transversally, so that the opening is continuous across the



FIG. 18.



A



B

FIG. 20.

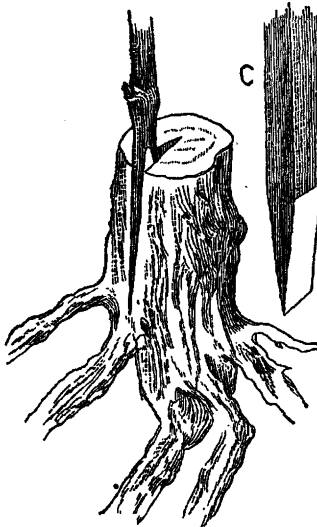


FIG. 21.

whole. At the two extremities of the slit so formed the scions are placed as represented in Figure 22.

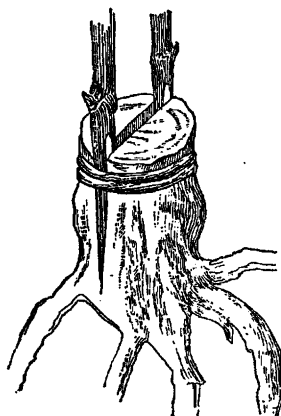


FIG. 22.

The scions should be made of uniform size in order that the slit may be spread to an equal width at both sides, and thus fit the sides of the scions and bring the bark of both into contact. With a little judgment it may be easily determined whether the joint needs tying, or whether the point of the scion is squeezed tight enough to hold it in place and resist a slight tap or knock.

This transversal graft is most frequently employed when the subject root is equal to in size or but little larger than the graft, as by this a uniform fit and contact of the two parts is assured, and thereby a ready growing together of the bark and perfecting of the union. If the root be large enough for two scions and still small, the two scions may be put even contiguous, as represented in Figure 24.

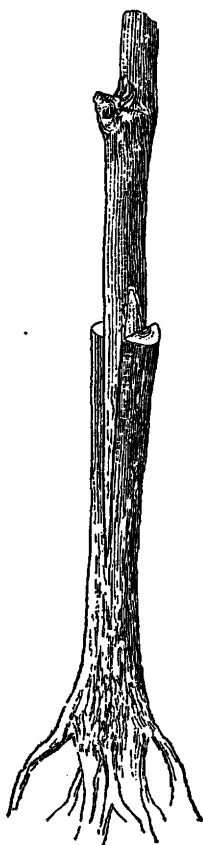


FIG. 23.

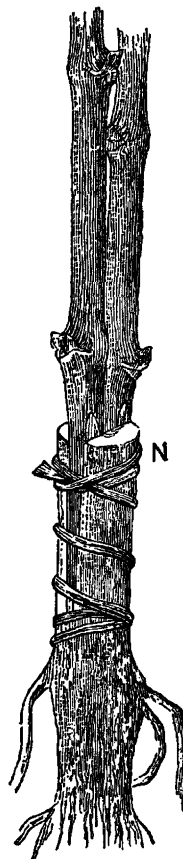


FIG. 24.



FIG. 25

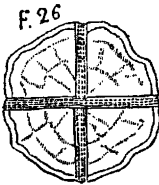
In all cases where the graft is to be fixed on the vine in place, where the vine is cut off to receive the graft below the surface, and it is desired that the graft itself should take root and eventually succeed the old stock with independent roots; it is then preferable to make the slit or cleft in the graft itself and point the root so as to receive the graft astride of the root. But when the grafting is done, after the vine or root has been planted and the above transformation in the roots is not desired, the simple cleft graft is best employed even with cuttings.

It is advantageous in all cases, in order to assist the cut in healing over, to bevel off the edges of the piece which has been split, as represented in *B, B*, Figure 25.

19.—SIMPLE CROSS CLEFT GRAFT.

Cut two slits perpendicular to each other and insert four scions instead of two. (Fig. 26.) The same operations with regard to tying and waxing apply here as well as to the preceding systems.

FIG. 26.



20.—SIMPLE OBLIQUE CLEFT GRAFT.

The operator may sometimes be unable, for some reason, to split the vine crossways; perhaps the vine would be injured thereby; perhaps the pith or middle would not permit of it, being unsound. Again, it may be desirable to have six grafts instead of four. In any of these cases the vine may be cut bias on three sides, as represented in Figure 27, the cuts forming chords of the circle; into each extremity of these chords a scion is inserted, whose point is cut obliquely, as represented in Figure 28. This system usually requires tying before applying the wax.

F. 27

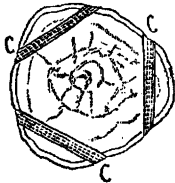


FIG. 27.

21.—CLEFT GRAFTING, WITH A CUTTING GRAFT.

In place of cutting the scion and inserting, we here make a cleft on one side of the vine, after cutting it off at the proper depth, and into the slit thus made insert the cutting prepared, as in Figures 29 and 30.

The sides of the cutting are pared off obliquely to a point, allowing two or three buds above, and



Fig. 28.

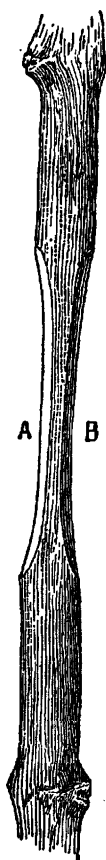


FIG. 29.

enough wood below to reach well down into the ground by the side of the vine. (Fig. 31.)

The cutting, placed as in Figure 31, is well waxed and the earth raised over it to protect the joint. It is useless to explain how these grafts may be bled by making a transversal cleft, quadrupled by three cuts on a bias, etc.

22.—INVERTED OR SADDLE-CLEFT GRAFT (A CHEVAL).

This system is best illustrated by inverting the ordinary simple cleft graft. (Fig. 32.)

When grafting rooted nodes or shoots, or small rooted vines, or even roots, it becomes especially valuable to be able to point the latter and cleave the graft itself. The process is an easy one: with the ordinary grafting knife with hooked blade the cut is made upward on each side, thus pointing the root in good shape,—whether it be knotty or disabled it matters not.

When the cleft is made downward or on the root, there is danger of gravel falling into it, or dirt even may injure it. Again, the crack thus made forms a receptacle for water, which, in case of insecure waxing, may run in. This latter danger is the greatest one, and one which the utmost care should be taken to guard against. In the inverted cleft graft, all danger from both the above sources is avoided, the upper piece forming a covering of the whole.

No grafting is easier than this, nor is any more apt to be done right than this, on account of its perfect simplicity, the surfaces adapting themselves so readily and the parts being so easily handled. Cases are cited in which this system has been used in grafting on simple rooted joints or nodes, done within doors and away from the field, on Taylor, Cunningham, Norton's, Cynthia-



FIG. 30.

ana, Herbemont, etc., and on rooted vines of Jacques, Black July, and Louisiana, all of which sent forth roots and branches like a year old vineyard from rooted vines. These cases include only grafts made on roots or rooted vines, but it is believed that by using varieties which take readily, it might be used to connect cuttings with easily rooting varieties.

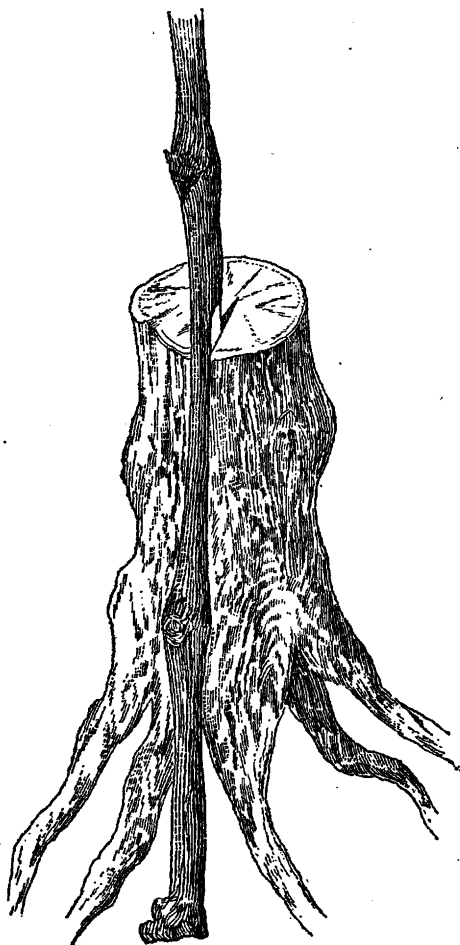


FIG. 31.

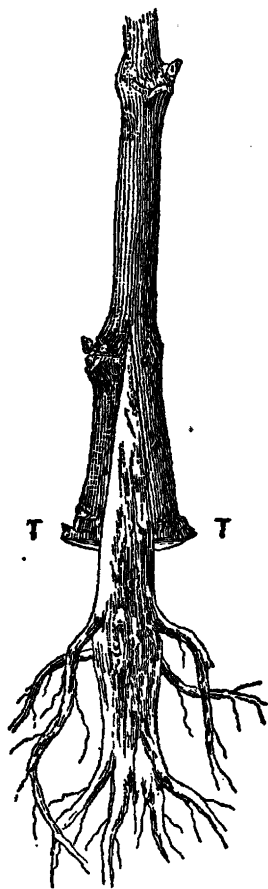


FIG. 32.



FIG. 33.

The graft is so simple as to hardly require illustrations. It may be seen by Figure 33 how the same graft may be duplicated if the root be wide enough. In concluding this system, it need only be said that this graft, being especially designed to facilitate the rooting of the graft, should be so cut as to prepare for the proper putting forth of roots, as, for instance, *T T*, Figure 33.

III.—NOTCH GRAFTING.

In cleft grafting the wood is split only, this answering the purpose. The plan has been conceived by some of notching the wood and then cutting the graft round, square, or wedge-shaped, to fit exactly the notch so formed. Numerous terms have been applied to this system; and also numerous instruments have been invented for making the notch to receive the graft, as well as for fashioning the graft to be inserted.

The terms and methods applying to the various modifications of the system are:

23.—SQUARE LATERAL NOTCH GRAFTING.

24.—POINTED OR WEDGE-SHAPED LATERAL NOTCH GRAFTING.

25.—ROUND LATERAL NOTCH GRAFTING.

Figures 34, 35, and 36 indicate plainly the three.

FIG. 34.



FIG. 35.

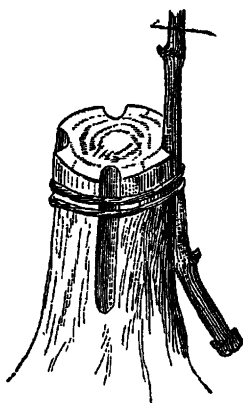
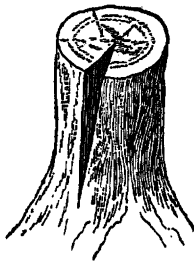


FIG. 36.

From these figures it is readily understood how this system, as that by approach and that by cleft, may be applied, any one of the three, for

26.—NOTCH GRAFTING WITH CUTTINGS.

Of which an example is seen in Figure 36.

IV.—LAYER GRAFTING.

Throughout the age of vine-growing, the soil adjacent to the mother plant has been used, and sometimes improperly, for renewing vines; the same being done by simply burying the branches, in order, in forming a new plant or setting, that nutrition should continue from the mother vine while making its roots. This system becomes especially advantageous in the introduction of cuttings difficult to start, and in assuring the successful multiplication of any other vines, and for these purposes it is utilized in a number of ways.

27.—LAYER GRAFTING OF RESISTANT ON NON-RESISTANT VINES.

One of the first uses made of layer grafting was that of uniting the resistant, *A* (Fig. 37) on the non-resistant, *F*, vines, an operation which with other systems is quite difficult.

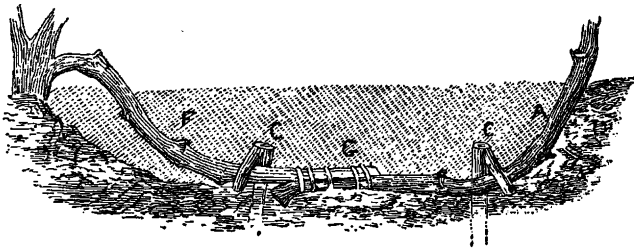


FIG. 37.

After making the graft, the union, buried from four to six inches beneath the surface, is maintained at this point by two wooden crotches or notched stakes, *C C*. The system employed in joining the two pieces is of secondary importance, and one may use the simple or double cleft, the inverted graft, or graft by approach, as in Figure 37, *G*; only, care must be taken to have the variety which it is desired to root on the downward side.

Suckers may often be found which will answer for this graft and thereby avoid the necessity of using the fruit wood. The sucker serves to root equally well, and draws little sustenance from the vine. By the use of this system of propagation, fine rooted plants, giving canes many feet long the first year, have been obtained from the Jacquez, Cynthiana, Norton's, Virginia, and Black July, supplied, as above, by vines almost dead and past bearing entirely.

If old vines be employed to root resistant vines by this method, the old vines may be best prepared for the operation by cutting off the previous year near the surface of the ground, thereby causing them to put forth a generous supply of suckers.

28.—LAYER GRAFTING OF A NON-RESISTANT ON A RESISTANT VINE.

In the preceding method it was desired to obtain a rooted plant of resistant stock on to which, subsequently, a non-resistant variety might be fastened. With this the latter necessity is sought to be avoided by forming a resistant root, and then joining some desirable variety on to this at a point so near the surface as to be able to prevent the graft from taking root and thereby becoming non-resistant. In this case care must be taken in fixing the length and position of the long cane, in the selection of the graft or scion, and especially in selecting the system for uniting the parts.

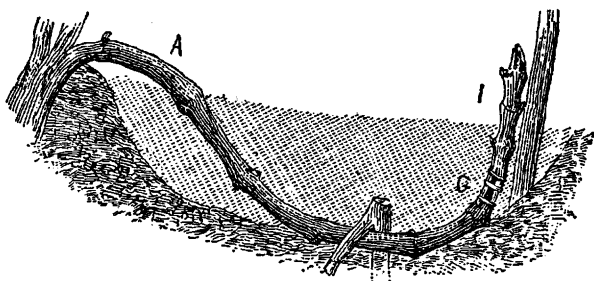


FIG. 38.

The non-resistant scion *I* (Fig. 38), must be placed near the surface of the soil to avoid its taking root; to accomplish which the cane to which it is to be attached must be long enough to allow of the bend being made entirely in the resistant branch, *A*. When the rooted plant thus formed shall be transplanted, the following year the point of union *G* should be placed at the surface of the soil. The layering and covering of the graft requires the greatest care possible. As to systems employed in uniting the parts, the simple cleft graft (No. 18, Fig. 25), or, better still, the Champin graft, described further on, is especially suited.

29.—LAYER GRAFTING, BY INSERTING A RESISTANT BETWEEN TWO NON-RESISTANT STOCKS.

This system is applicable when the vigneron is in possession of non-resistant vines and resistant cuttings, and it is desired to obtain a proper producing variety on a resistant stock the first year, making a sure union and forming abundant roots and a strong plant. To do this we combine the two preceding systems, giving the curve to the cane of the non-resistant vine, *F* (Fig. 39), uniting with whatever

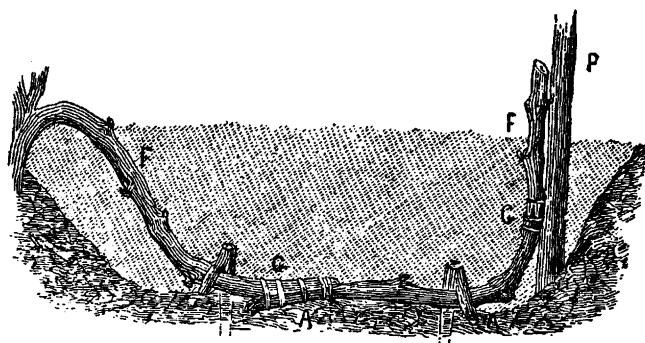


FIG. 39.

system may be most desirable at *G*, and leaving at least two or three buds on the resistant cane; then give all care possible to the second graft, *G*, and success is certain.

All operations connected with this system are of the greatest simplicity and easily performed: a suitable cane is selected in its natural position; grafted in this position at a height convenient to work, the second being done likewise at a convenient height above the ground. The trench being dug, the vine thus augmented and changed is laid down and fastened with care, and the whole covered over after tying the graft up to a stake. There is equal simplicity in Figures 37 and 38. Care is necessary in layering and covering the cane, to avoid deranging the grafts.

V.—GRAFTING ON ROOTS.

Grafting on roots is quite as old a custom as grafting on branches, but does not play a very important part in viticulture, at least not for uniting European vines on resistant stocks.

30.—GRAFTING A NON-RESISTANT STOCK ON A RESISTANT ROOT.



FIG. 40.

The first requisite is a root of the proper size to permit of the insertion of the scion. This is by no means easily found. Laying aside the case in which the operation is performed on the root of a vine remaining in place, or a single one or few, it is no easy task to satisfy the important requisite of this graft.

Of the young resistant vines taken up from the nursery to be planted elsewhere, there are some few to be found large enough and suitable, *R* (Fig. 40), to receive the non-resistant graft.

This graft offers no difficulties in execution, taking perfectly; but so rarely is it used that its advantages need not be dwelt upon here. The same system will be found under another form in the "graft on rooted nodes or joints."

31.—GRAFTING A RESISTANT CUTTING ON ANY VINE ROOT.

This is often done to make sure of the growth of a cutting, and is of great practical utility, as it enables any kind or size of roots to be used; to be sure, the roots of resistant stocks would be the best, for after assisting and supporting the plant in the formation of its root system, it would in itself prove an important aid by increasing the resistance of the whole radical system; but the resistant roots, lacking others, could be substituted with equal temporary benefit. Nor need the size of the root matter; it may be tacked on, *A B* (Fig. 41), by approach or cleft, if small, or if large enough the inverted system *C C* may be used. It is easy to choose between systems of uniting the parts, depending, of course, on their size, shape, etc. When this system is practiced it becomes next to impossible to determine where the joint has been made, especially when the inverted graft has been used.

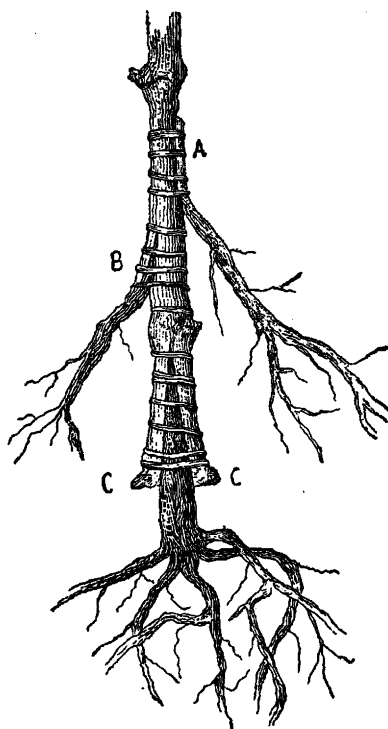


FIG. 41.

VI.—MIXED GRAFTING.

All of the systems given in the following chapter are easy of execution and take readily. Several of them are applicable to the common methods of culture and are generally serviceable; some, on the other hand, are useful only in certain cases; none are there which are not more or less practicable and useful.

32.—ARCH OR REVERSE GRAFT.

This resembles graft by approach No. 1, except that in place of giving the graft a double curve in the form of an S, and thereby producing a parallelism in the two parts, a curve of the graft is brought from above into union with the subject, to which it is to be attached, into which latter it is inserted in a manner somewhat similar to that adopted in the cleft graft. (Fig. 42.)

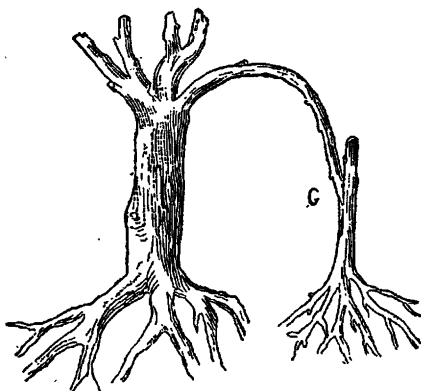


FIG. 42.

The system used for uniting the parts may be that by lateral incision, as seen in the figure, or by simple or double cleft. This graft is used at the present day in some places, and recommended even by official documents, from which Figure 42 is copied. It depends on the principle that the sap circulates indifferently in either direction. The subject, in which the sap circulates differently from that in the graft, becomes readily united to it and continues to nourish it, when, after the union is formed, the graft is separated from the mother vine.

33.—CROWN GRAFT.

Instead of splitting the vine to receive the graft, the latter is inserted between the bark and the wood, first being trimmed down to a long slender point, pared off on a single side only, which is made to slide smoothly along the wood beneath the bark. This system is

one of the best, and is especially useful for aerial woody grafting of trees with regular and flexible bark. But it is difficult and uncertain when applied to the vine, because of the irregular, twisted, and cracked bark.

34.—HALF-CUT GRAFT.



Figure 43 explains this graft, in which the two surfaces of contact, parallel *A, B*, are carefully adjusted to secure the circulation of sap. Here the right angles, *C, A, B*, and *D, B, A*, and the end surfaces, *C, A*, and *B, D*, present, besides the difficulty of properly adjusting them, a condition very unfavorable to the proper uniting of the adjacent and end to end parts.

35.—SHIELD GRAFTING.

Shield grafting is too well known in its application to horticulture to need explanation here. It has not given me good results applied to the vine, and for good reasons it is hardly adaptable to viticulture.

36.—SHUTTLE GRAFTS.



This is an ingenious operation, which consists of inserting with the bud upwards (*H, B*, Fig. 44)—an eye, cut off in the form of a shuttle; designed, in the first case, to furnish branches of the variety desired for fruit; in the second case, to furnish a stock desired for roots, which roots, in the latter case, are formed more readily than if the subject above be depended upon. Both are usually necessary to form a resistant vine and furnish desirable fruit.



FIG. 44.

37.—BORING GRAFT.

In place of grubbing up the old vine, or of making use of it by attachment with other grafts, using wax, etc., we are here content with sawing off the vine horizontally beneath the surface of the ground; then, with a gimlet, screw, or auger, boring a hole near the circumference, may be vertical, or, better still, inclined from the outer edge toward the center of the vine, and being a trifle larger than the scion to be employed. The hole thus bored should be from one to two inches in depth. The graft is deprived of a portion of its bark, and sometimes a portion of the wood is whittled away. It is then forced, or perhaps driven with a few taps of a small mallet, into the hole prepared. It is here seen to be unnecessary to use either grafting wax or cord, the earth with which it is to be covered serving in its place. It is necessarily solid, perfectly adjusted, and at first blush appears to possess all the conditions favorable to the perfect union of the parts; not so, however, for although appearing to unite, because of the moisture furnished by the old vine, it is really not united, and will seldom develop properly. The failure may be owing to the derangement of the fiber, resulting from the forcing in of the scion, or it may be owing to the difficulty in obtaining a perfect fit without injuring the parts. Be that as it may, this system I should advise leaving to experimenters, or to those who "always succeed."

38.—THE INLAID GRAFT.



FIG. 45.

It would be unreasonable to suppose that from the start, in devising the various systems of grafting, some one should not think of performing the work with a machine or instrument, and that with sufficient precision to make the parts cut to fit each other mathematically. (Fig. 45.) Machines have been invented, and with them we may cut out the piece, and the new part then by hand, bind and wax, and all is done. It has been truthfully said by those who have used the machine, that every other eye in the vine thus prepared will put forth except the one which has been added. Various choices may be used in making the cleft and corresponding joint to fit.

There yet remain grafts on double branches, grafts by incision, tongue and cleft, lateral, simple or double, and a whole series of grafts, based on diverse theories of their inventors or on funny fictions. Each day reveals new methods of grafting, which, though novel, some interesting, others valuable, for the most part afford only laughing stock for the viticulturist.

INDOOR WORK AND DOUBLE-CLEFT GRAFTING; OR, CHAMPIN GRAFT.

A. Champin, the French author of this work, is accredited with first having proposed and made common the methods of grafting within doors for the vineyard. He does not claim the credit of inventing the indoor work, but only its first application to vineyard work.

I.—THE WORK WITHIN DOORS.

There are certain marked objections to grafting as performed in the field. To lay bare the trunk of the vine to the proper depth, and that over an area sufficiently large to permit of its being sawed off horizontally, the notching or cleaving of the vine without allowing the dirt to enter, and the introducing into the cleft grafts, to fit which it may be necessary to change their shape a number of times, to attach them solidly and to wax them—all these are operations which require close attention, skill, and precision, coupled with hard work for the feet, knees, back, and hands; then, too, the elements, rain, mud, etc., have to be contended with, rendering this important operation one of some chance in execution. Days must be chosen, which are rare in the season, proper for the operation.

It is desired in what follows to give to the reader a few methods which overcome the objections above given, and to substitute a system easy of execution, moderately certain in its results, and one in which time, and especially weather, may be left out of consideration.

Practical men are apt to deride the indoor grafting system as a viticultural fantasy, but it is stated by Mr. Champin that in consideration of its great economy in labor, time, and opportunity, together with the marked success obtained through its use, it is of the utmost practical importance. It often becomes necessary in hot and dry climates to suspend operations during the middle of the day. In moist climates weeks are sometimes lost in awaiting a favorable epoch. All this is avoided with the indoor system. Grafting in the field is an exceedingly difficult operation and very fatiguing, and although answering where small plantations are made, it is not applicable to vineyards containing thirty or fifty thousand vines, unless skilled labor be cheap and laborers plenty. With the indoor system any day or hour may be chosen, and the grafts, innumerable, may be made by the fireside or anywhere within closed premises. It is often objected that the subject for grafting by this method must necessarily be too diminutive to properly nourish the graft; that the vines should have attained an age of four, five, or six years before grafting.

All of the above are insufficient to overcome the one advantage secured by indoor grafting, viz.: the length of time through which the grafting period may be extended and the greater amount of work thereby accomplished. By calculating the time required in reconsti-

tuting with grafts a few thousand acres of vines by other systems, it will be seen that, all things considered, we should never catch up with the march of the phylloxera. For instance, allowing a skilled vineyardist to graft in the vineyard one hundred per day, a fair average, this means ten days per acre (one thousand vines per acre), and it may be seen that the most valuable time of the vineyardist, or that at a season when time is very precious, would be entirely consumed. By resorting to work which can be done under cover it is found that through all periods alike the work may go on and available time is doubled, and by the use of proper contrivances, machines, etc., the number of grafts may be trebled; then, too, those may labor within doors in ease and comfort who might be incapable of doing so in the vineyard, or at least only with tiring and trying exertion.

II.—PREPARATION OF THE VINE TO BE GRAFTED.

We are now to consider the system which demands our attention only where and when it becomes convenient; for instance, at a convenient time we arrange for our work in the garret, barn, or other convenient place which provides sufficient room, a table, on which are fastened grafting machines, and about which are placed the vines to be operated upon and the scions.

The operation may be applied to one of two kinds of subjects—may be a rooted plant or may be a cutting.

To arrange for the former the work must be provided for at least a year in advance, by rooting the cuttings in nursery, or by forming rooted nodes—burying the cane while growing and attached to the old vine in the vineyard.

1. Rooted vines are plants formed from cuttings placed in the earth the previous year, and which, during the Spring or Summer, have emitted roots, which roots must be carefully protected until returned to the soil.

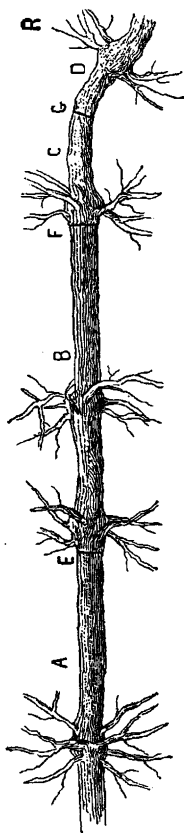


FIG. 46.

2. Rooted nodes are produced accidentally or purposely in the old vineyard; in fact, the grafting within doors I first practiced on this class of roots. From the Cynthiana, Norton's, Virginia, Herbemont, and Cunningham, layered in Spring, I was able to dig in Fall nodes of considerable length and proportions, some of which possess roots but no branches. After using those, with branches for other purposes, the remaining rooted nodes it struck me I could utilize by grafting on to them cuttings of susceptible varieties, or varieties difficult to root by grafting *à cheval*, or with the saddle graft, which was the only process applicable to such small pieces.

From the French grafts on these rooted nodes, from American stock, I have obtained excellent results, the rooted nodes having been formed by carefully layering the canes, and allowing only their extremity to project from the ground.

The American vines are usually long between the joints or nodes, and thus admirably suited for this purpose. A single layer or cane provides an excellent subject for grafting, and, if desired, it can be cut up into a number of subjects, each to receive a graft.

Thus, for instance, the root represented in Figure 46 gives, by cutting at *E* and at *F*, two good subjects, *A* and *B*; then by cutting again at *G* we have two smaller ones, *C* and *D*—both good for the saddle graft, or *à cheval*; it making but little difference to the graft or the subject which side the sap comes up.

It has before been remarked that after the canes of the vine have laid in the earth a year—and more so, for canes lying covered for two years, which have put out roots—their tissues suffer cer-

tain important changes which transform the cutting to a root; they become dense and fine; the pith diminishes and the sap increases; all of these serving to favor the taking or connecting and the consequent success of the graft. The rooted nodes of the Cunningham, among others, partake of the appearance of ivory in their white lozengey tissue, with moist and brilliant reflection; this indicates an abundance of sap. Layering I recommend to all grafters as an easy and economical means of procuring roots for grafting; useful among all varieties, and especially among those the cuttings of which are difficult to root.

3. Simple cuttings are the third kind of subjects employed, and which, on the whole, perform the greatest service. It is well that cuttings used for this purpose should have at least two or three buds beneath the point of grafting, though one may be made to answer in extreme cases.

Now, all of our plants to be used in grafting, being prepared some time in advance of the work itself, should be kept in moist sand, neither dry nor wet, in some cool place, with northern exposure, covered and protected as much as possible, and, if convenient, under lock and key. This makes a perfect treatment.

Up to the year 1879 inclusive, I have kept my plants and scions without other covering than sand, they being placed, perhaps, in a tub on the north side of a wall, or perhaps in a deep trench. But the incessant rains, which have continued from October till June, have caused me and many others so much annoyance and damage, that I now insist on the necessity of the grafter having some cover; for instance, a cellar ventilated and not too wet. Again, a cart house or other shed may be used, open or exposed to the north, in which the roots, cuttings, scions, and all may be preserved until needed for grafting.

I insist on the above method of preservation of stocks and scions, which is not, however, so necessary in the south, where the season is milder. Some months there are when covering is unnecessary, but, following the records, it is found that there may be six months of wet and wind.

III.—PREPARATION OF THE GRAFT.

In the first place, let me protest against the very common practice of cutting the scions, like the cuttings, six months before they are needed. In spite of the fact that they may be kept this long, it is still true that the shorter time they are kept the better.

The best time to prepare the scion is in February and March, as late as possible before the sap begins to move; not that the new sap would become an obstacle or detriment in itself, but because the subject or root should be somewhat in advance in starting of the scion, in order that the union may grow upward from below. If the scion were in advance of the root it would be more apt to dry out perhaps before the operation, or possibly after it. Once cut from the vine, the canes destined to furnish scions should be put under cover, protected alike from all atmospheric influences—heat, which robs them of some of the sap, wind, which dries them, and excessive moisture, which will serve to rot them.

The effect of moisture on scions or cuttings is singularly variable, a fact which I am unable to explain, but which I know to be so. For instance, branches may be entirely submerged in clear water, or even a pure mud, and allowed to remain there a whole month without losing their properties to unite and grow. Again, a much less time's submersion in a wet medium—in sand or earth—may so fill them with moisture as to totally obliterate the sap and render them incapable of making a union, or even growing as cuttings.

The condition of the pith is, above all, important in determining its value. In its normal state the pith varies from a brown or almond color to a clear, brilliant, or micaceous yellow; it is fresh in appearance, and is always a little glittering—never the color of silk, pasty, dull, blackish, nor fuliginous, these latter being signs of deterioration. When a branch presents these latter symptoms, my grafter cuts off and rejects joint after joint until arriving at a healthy pith. This process I recommend to all grafters, for it is better not to graft at all than to employ poor scions.

We have not finished the examination when knowing that the cane or scion has not been injured by moisture; we must further know that it is not too dry. It is often difficult to determine when the cane is too dry to be used for grafting, fit then only for firewood.

The pith of the vine will indicate to us readily enough whether the cane has been damaged by moisture or not, but it will not determine its damage by drying. For the latter, the appearance of the wood is of the most value. When the wood is of a beautiful green, all is well. When it is whitish, although green in color, or when dry, though somewhat green, it is necessary to suspect it. The color is the best optical guide, but even this is not certain enough. The one infallible sign is freshness itself; it must be so to the touch and by general appearance; it must show a surface glistening with moisture, especially where cut diagonally and held so as to reflect the light; the sap must be fresh, and the surface cut, luminous.

It is a difficult task to determine when the graft should be rejected, and the only way to eliminate failure in judgment of it is to reject all that we are not certain are fresh. It does not pay to run any risks in choosing the good ones. It sometimes occurs that the grafts of a

somewhat doubtful nature are so valuable or scarce that a trial with them may be the only expedient; in this case they should be allowed to stand a few days in water, a process, however, which is perfectly useless for fresh scions. When soaked, it should be in tepid water, not cold, and the graft then submerged only partly, the water covering the lower part of the cane, and the upper part exposed. This operation is not to introduce the water into its pores, but the moisture, with the warmth and air, revives its vitality, puts its sap in motion, and renews the dormant life yet remaining in its tissues. We may be able by this process to put the cane in such a condition that it may be used with confidence.

Finally, if it be some precious and unique cutting, which, in spite of our endeavors, shows neither life nor glistening sap, and we risk it, it then becomes a miracle if revived from its inertness to a vitalized organism.

IV.—CHOICE OF THE GRAFT AND CONDITION OF THE BUDS.

All of the branches of a vine do not possess the same qualities, nor are the same qualities to be found in any two successive buds, from the butt to the extremity of the cane.

When grafting a tree, the operator always selects the scions with great care, discarding them in accordance with their inherent defects, the condition of their buds, and the buds which will put forth. We expect the bud of a red rose to produce a red rose, a white grape to produce a white grape, a large pear to produce a large pear, similar to that of the mother plant. For these qualities this will answer, but there are others to be sought for, to find which requires study and observation.

Fructification, more or less rapid, more or less abundant, more or less constant, is one of the qualities which is regularly transmitted. Experience regularly proves that the production on certain trees may be biennial by grafting, as with the pear, for instance. Grafts taken from the pear during its year of repose will never be so fertile as those taken from the same tree covered with fruit buds. Again, if from the same pear tree grafts be taken from one branch, a fruiting branch, and from another, a non-fruiting branch, the trees formed from the first will possess a natural tendency to fruit; from the latter, to produce wood. The part produced by the latter may be influenced to fructify; but as this influence will act stronger in the former, there will always continue a difference, resulting from the difference in the scions.

The vine being naturally very prolific, we are but little concerned at present with this question, which, however, would become very difficult if studied and applied in accordance with the true theory to large vineyards; but I have deemed it necessary only to draw attention to this question, which does, in its use, ameliorate the objection to some choice varieties, which are shy bearers, by the judicious choice of grafts.

Even the buds of the same cane present differences, like the canes themselves. Those buds nearest the spur or butt give vigorous vines and produce long and heavy canes without producing abundance of grapes. Those at the extremities of the branches differ in producing more fruit than wood. As to those in the middle, they have medium qualities. My own opinion leads me to prefer the middle buds, because I recognize in them the following excellent qualities: the first requisite of a good vine is that it shall produce grapes in contradistinction to an excess of wood, for it will always produce sufficient wood. It is necessary that the graft should be as small, if not smaller, and not more vigorous than the subject to which it is attached, in order that it shall make a good union and not outgrow the capabilities of the root; this is especially true with regard to the grafting of American vines, which are generally smaller than branches of the same age from the *vinifera*, or European vines.

I will not go on here without demanding an attentive examination of the particular bud which is to produce the vine to come. We find it composed of a little protuberance, round, smooth, and pointed, in which exists the embryo of the future growth, protected from

heat, cold, and wet by a downy covering, which is in turn covered by small scales, making the whole close and solid. By the side of this principal bud is found an auxiliary, sometimes called latent bud—often a number of them forming a precious reserve to take the place of the larger one in case of its loss or damage. This little bud is somewhat hidden, and sometimes scarcely visible, but it is long-lived; being less exposed to accident, it often survives the other. Between the time of pruning and that of grafting, in the handling, etc., damage is apt to be done to the most prominent bud, or it may put forth owing to a premature action of the sap; then the smaller bud, as yet uninjured, takes its place. To avoid loss, we must appreciate the value of this modest and obscure organ.

The bud is quite often injured, or perhaps rotted, and when so may be to all appearances intact and perfect, but nevertheless completely destroyed by over-abundant moisture, which rots the embryo within its retreat. One of the buds may be examined by raising the scaly covering, and proceeding with a study similar to that already indicated for the pith, inasmuch as the modifications have more or less the same appearance and produce similar results. Another symptom of alteration is found in the bud becoming soft instead of being firm and hard to the touch, in which case it may be easily raised or dislocated by handling. The cutting is then in poor condition and should be pitilessly rejected.

To be sure the auxiliary bud is present to supply the loss of the other, but we can never determine what may be its condition. Prudence recommends that we should employ only those buds which are perfect in appearance and rely on the auxiliary bud, only to take the place of the principal bud in case of accidents arriving after the grafting.

A more extensive and more complicated problem arises in the choice of the variety than in the choice of the graft—be the grapes for the table or for the winery. Each country has its customs and its preference: the Pineau, the Sauvignon, the Syrac, the Cabernet, the Gamay, the Mondeuse, the Grenache, the Carignan, the Mourvèdre, the Spiran, the Malbeck, the Côt, the Folle, the Aramon, and a few others, continue always the first in those regions established as their empire by the good results obtained from them. It is certain, however, that grafting brings in numerous and valuable additions to the choice of cuttings used in each region. It is a study which is only begun, and merits the attention of viticulturists generally.

The only general rule which can be laid down is to always bring the varieties from the north to the south, rather than from the south to the north. By this means is secured the first and most indispensable quality of the grape, its complete and certain maturity.

It is not necessary to exaggerate this rule by bringing them too great distances; but in order to secure perfect maturity and all the proper qualities, it is necessary that the grape should hang on the vine long enough to ripen and mature slowly. If the Burgundy vineyards, with their peculiar soil, were transplanted to Toulon, I doubt whether its Pineau, which ripens at the beginning of August, would give wine by harvesting at the end of September.

Personal experience and comparisons of experiences are the best guides in this important and interesting question. Reference should be had to the work known as *Le Vignoble*, written by Messieurs Mas and Pulliat, or to "*Descriptions et synonymies de mille variétés de vignes*," by M. Victor Pulliat.

V.—THE ENGLISH GRAFT.

In order to better understand the different methods of preparing the clefts, tongues, and cuts which go to make up the Champin graft, and to understand the differences and advantages it possesses over the English graft, it will be necessary to explain it in theory. In studying the organisms of plants, we find that the parts do not join, by the circulation of the sap between superimposed cross-cut surfaces



FIG. 51.

formed by bringing the parts together end to end; but that they join readily when the parts are brought one against the other, severed in a direction nearly parallel to that of the fibers of the wood.

This explains the facility of joining the graft by approach; the difficulty of joining the parts merely separated and superimposed, and the particular necessity of striving in all cases to approach nearest to the parallel cut surfaces of the cells.

39.—SIMPLE ENGLISH GRAFT.

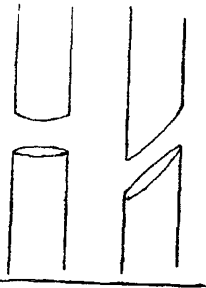


FIG. 47.

FIG. 48.

Figures 47, 48, 49, 50 indicate the progression that is necessary to follow to lengthen out the joining parts, end to end, and to approach that parallelism which assures the uniting of the parts. Figures 49 and 50 indicate the cutting practiced for the simple English graft, and Figure 51 the parts united.

This cut constitutes a progression, at the end of which the parts are sufficiently elongated to make them unite. This system is used for certain varieties of plants subjected to gumosity, such as the apricot; but it is an objection to this system that the surfaces, being oblique, it wants solidity, and, for slight causes, the parts are apt to become dislocated.

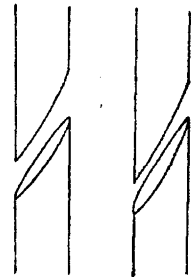


FIG. 49.

FIG. 50.

40.—ENGLISH CLEFT GRAFT.

In order to remedy the above inconvenience, there are made one or several little tongues on one to insert into one or several incisions made in the other to receive them, in which case each little tongue adds not only to the solidity of the graft, but also to the chances of the ready circulation of the sap. It augments the number of surfaces brought into contact, which amount to considerable. The tongue and the cut to receive it is one third the length of the oblique cut, which has itself the length of about three times the diameter of the graft.



FIG. 52.



FIG. 53.

These are about the dimensions given in the models and treatises on grafting. All of the designs are made in such a manner (Figs. 52, 53) that they suggest immediately the idea whether the tongue can be made equal in length to the cleft prepared for it. The truth is, that beginners are often arrested with

this difficulty in cutting against the grain of the wood, which, if well done, may answer, but if not fitting, defeats the success of the graft.

In reality, it is impossible in practice to bring the two surfaces into such perfect contact as is shown in cuts and designs.

Figures 54 and 55 give us an idea of just how the English cleft graft looks in practice.

Examining Figure 54, the transformation necessary for the parts to undergo in practice in order to enter one another is truly seen.



Fig. 54.

Figure 55 represents 54 changed, as becomes necessary. Now, endeavor to make the tongue *F, I, K* enter the slip *B, A, D*, and the tongue *A, D, E* enter the cleft *G, F, I*. This is where the difficulty arises. It is necessary that the angle *A, B, C* be brought against the line *I, K*, and the angle *F, G, H* against the straight line *D, E*.

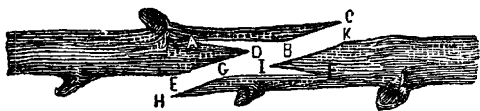


Fig. 55.

In theory this appears impossible, but still it can be done approximately, thanks to the flexibility and ready compliance of the wood of the vine. The tongues enter, bending a little in the corresponding clefts and the salient angles *B* and *G* broaden out somewhat, being applied at the middle of the straight line *I, K* and *D, E*; and when well tied, we obtain something which resembles, in a measure, Figure 53.

In spite of the easy bending and joining surfaces of this graft; in spite of the good results that it gives—thanks to the marvelous facility with which the parts of the vine unite—the imperfections of a defective cut subsist nevertheless, though perhaps hidden in the graft. It further presents grave difficulty in adjusting. The angular surfaces *A, B, C*, and *F, G, H*, always tend to separate from the straight surfaces *I, K*, and *D, E*.

When the two tongues are inserted into the clefts formed to receive them, a difficult task occurs. If the parts be not pushed tightly together the graft will want solidity; on the other hand, if they be pushed too far the tongue will lap over the bark, and there will be no connection of the sap.

The long tongues which terminate each part are, besides, very difficult to make regular by hand as they vibrate under the knife; if using a machine they are apt to crack and split. They have but one apparent advantage, viz.: that of giving good shape to the graft. But this is not what we are after. The appearance at first amounts to but little; it is the complete union which we desire—the connecting of the sap. Therefore I would suppress the long and defective points by cutting them off at the angle; not concerning myself with making an angular surface accommodate itself to a flat surface.

As it has been demonstrated that parallel surfaces unite more regularly than oblique surfaces, I would make the surfaces as parallel as possible.

One of my wise colleagues, who has published a treatise on grafting by means of machines, wrote me some time since that, "the fewer surfaces of contact there are the more chances of union."

From which it follows, as a mathematical consequence, that, to have an unfailing union, it is sufficient to have no surface in contact. It might be construed thus.

I do say myself that, the more surfaces brought into contact the more chances there are of union, and for this reason I have elongated the tongues and clefts of the English graft; adding not only the advantage of greater surface, but also that of parallelism to the fiber.

And I believe I have obtained a quadruple advantage, that of putting into uninterrupted contact equal parallel and numerous surfaces. I have obtained further a greater solidity than that of the English graft.

With these remarks, which are not completely useless, we will now return to our subjects and grafts, which we left in the garret, or other grafting room, arranged in good order, on a clean table.

VI.—CHAMPIN GRAFT.

41.—ON A ROOTED VINE OR NODE DUG UP.

We will first graft a rooted vine or rooted node. With pruning shears, or, better, with pruning knife, cut off the head of the plant as near as possible below the bud and above the part to which the graft is to be made, having first chosen an internode, as long as possible, lying between this bud and the next below. The head thus removed from the rooted vine gives us a plant similar to a rooted node.

Now follows a preliminary operation, which, although not indispensable, is practiced by the careful grafter: it is that of wiping clean the end to be operated upon with the corner of an apron, or, better still, with a coarse cloth kept for this purpose. This work can be quickly done, and is time gained, as we then may readily see the condition of the cut.

With a grafting knife, simple, strong, thin, wide, and not too long, possessing a large handle sufficient to fill the hand well; split the

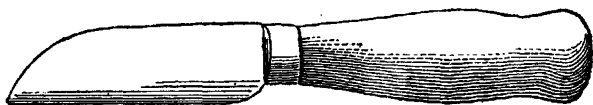


FIG. 56.

subject about a third or quarter of its diameter from the lower side, running this slit one or two inches long, varying with the size of the plant. (Fig. 57.)

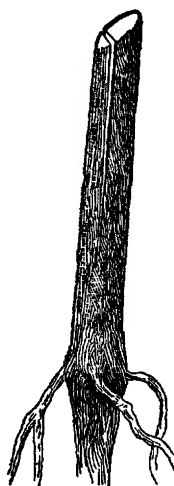


FIG. 57.

It now becomes necessary to grasp within the left palm, which should be above, the thumb well extended, and the index finger closed on the plant in such a way that the roots may be beyond the thumb; the direction of the stalk should then be toward the face, and such that the transverse slit to be made may come above, and that the surface formed thereby may be parallel to the line which passes between the eyes of the operator. (Fig. 58.)

With the knife, seized and held tight by the four fingers of the right hand, which fingers should be so near the blade that it comes part within the hand, so as to serve as a lever against the thumb, the extremity of the knife, approaching the thumb, severs all the wood above the connecting point by a diagonal cut. The width of this cut enlarges in the center of the plant, and terminates when reaching the slit already made.

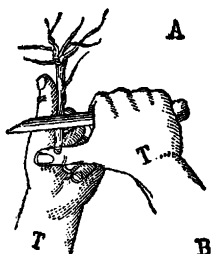


FIG. 58.

This operation is extremely simple, but to facilitate the labor as much as possible it is necessary that the blade of the grafting knife should be dressed off perfectly smooth on the under side, and that this side should never be ground on the stone. The blade should be always sharpened on the upper side.

It is seldom that we are able to sever the cane with a single stroke, except it be done by a machine; but it is of little consequence whether it be done by one or several cuts. The principal requisites are that the surface prepared should be smooth, single, regular, and uniform clear up to the point at which it joins the cleft (Fig. 59).

After the subject, comes the graft. It is easy to pick from those before us a scion which approaches nearly in size the subject to which it is to be attached; if the rooted plant be warped or arched we may find a scion to correspond.

If the two be equal in size, it is the better; if the scion be smaller it is of little consequence, but the scion should never be larger than the subject. The graft is usually composed of two eyes, and, like the subject, though in an inverse order, should be cut off below the eye in such a manner as to furnish a long internode. Thus the joining parts may correspond and be made perfectly similar in length and shape.

This done, nothing is easier than to join them; taking one part in each hand, the slit of one to the left and the slit of the other to the right, they may be pushed easily into place and maintained there in such a manner that the bark is joined throughout its whole length, at least on one side. *Now, make sure that the extremity of each tongue touches the bottom of the corresponding cleft* (Fig. 60).

There remains now but to regulate the extremity of the two exterior tongues. They should be cut off, squared, or sharpened down, depending on their fit. They do not want to reach quite to the commencement of the tongue to which they are attached. By this means a notch is left with angle of fifty or sixty degrees on the side now formed.

Some have objected to this system because it leaves this notch exposed; this objection, however, is readily overcome by supplying a covering of wax or mastic. Nature follows the example, and soon supplies a covering of bark, new, more regular and certain than the artificial covering used on the English cleft graft.

It is often asserted that the wound made below the earth surface will not heal as will that exposed to the air; but this is a mistake, for, if properly covered with mastic, it heals better beneath the surface than it could above. The earth serves as an additional seal, which, if added to the one we have added carefully at the time of forming, the wound makes a union hard to find at the end of a year, and seldom distinguishable, except by color of the different stocks.



FIG. 59.

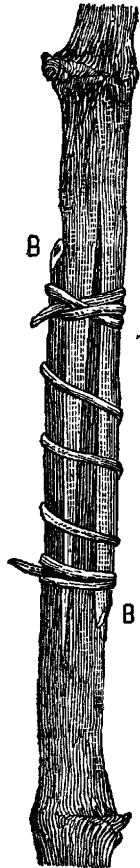


FIG. 60.

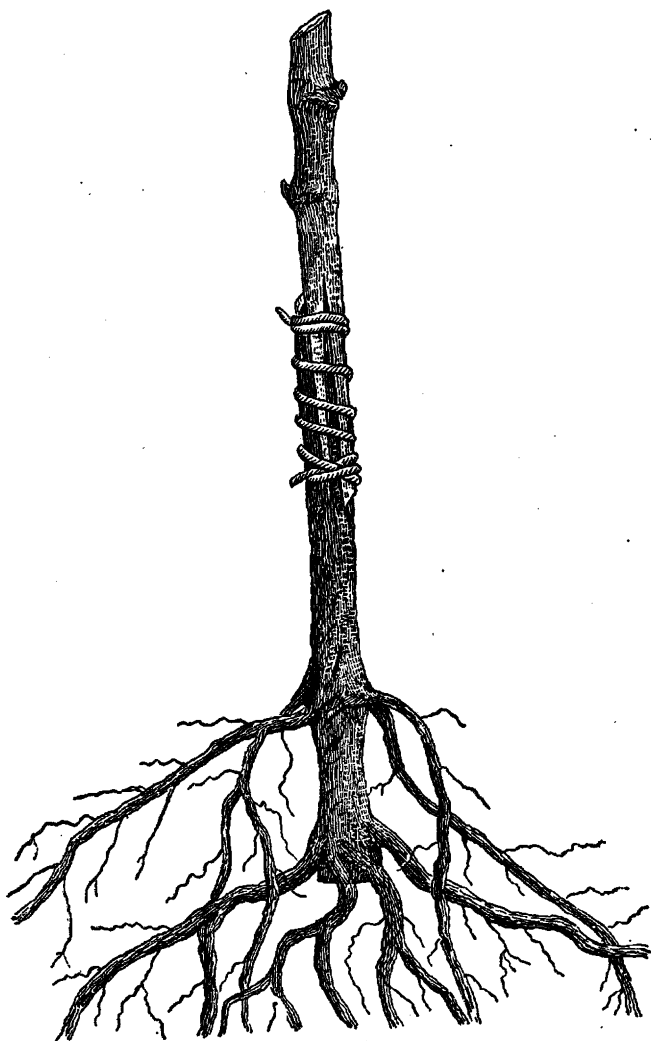


FIG. 61.

42.—GRAFT OF THE CUTTING.

In grafting the cutting, the tongue, cleft, and all are formed the same, with a single exception, very important to observe. The graft on a cutting is usually less certain than that on a rooted plant. I say "usually," because in the year of 1879 my experience and that of most other viticulturists was otherwise; therefore, instead of leaving and utilizing a long joint or internode at the top of the cutting to graft with, it should be short, something less than two inches; anything, so that we may graft above the upper bud, *O* (Fig. 62). Now, if the graft does not take, we may still have success with the rooting of the cutting. This will be better understood when we come to speak of the planting.

If by any accident in the handling of the cutting, it be deprived of its buds, though it be planted and form roots—which it may do without any buds—it may yet be made whole and utilized by grafting in, and thus supplying the necessary and missing part; otherwise it might be wholly lost.

It is seen that we may add buds to the rooted plant, and it is further seen that roots may be grafted upon an unrooted plant. Right here the question arises, "Is there any advantage in a grafted cutting over one not grafted, as concerns its rooting?" I say yes; for, in theory, the sap of the cutting when planted is drawn upon for the formation of branches at the expense of the root. Now, by interposing a joint which will momentarily retard the ascending sap, we are favoring the root. From practice I am able to cite a case in point, viz.: in 1879 the percentage of rooted vines obtained was greater from my grafted cuttings than from my simple cuttings.

43.—GRAFTING THE ROOT.

The saddle graft (*à cheval*), which has already been given, I consider simpler, easier, and more readily executed than mine for uniting a cutting to a root; but it lacks solidity, and is not so sure to take as a double cleft. If, then, we desire to hasten and facilitate the work and make it sure, as well we may, unite the two systems—the saddle graft and the Champin, which is easily done, as represented in Figure 63.

If the cutting which we desire to graft possesses a spur, a cross or butt piece, or any enlargement whatever, it is all the better for the saddle graft, as the protuberances favor the emission of roots. We allow to remain intact the side having the enlargement *T* (Fig. 63), and make the sharp tongue destined to be inserted. After adjusting it we obtain a graft, which, on one side, is

Fig. 62.



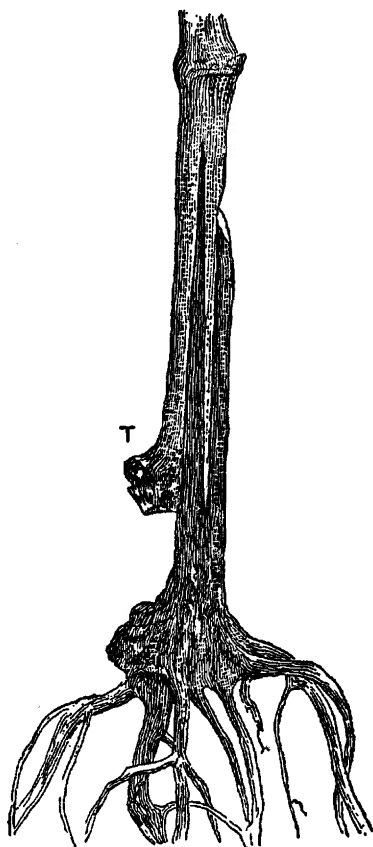


FIG. 63.

plants, and these are the ones usually operated upon, especially if grafting resistant vines. To be sure, the vine split to receive the scion may be so irregular as to require the latter to be sharpened in a knife-blade fashion, in order that it may be adjusted to the irregularities; but this offers the double assurance of its taking.

If we desire to root the graft, to enable it to free itself from the subject grafted, the Champin saddle graft should be used: but if grafting a non-resistant upon a resistant variety, near the surface; to avoid its taking root, it should be grafted with the double cleft and tongue, in order that it shall not only be a good graft to take, but also to make it secure against damage from the winds.

the Champin graft, and on the other side a saddle graft.

I consider the root graft and the saddle graft as valuable means of making rooted cuttings; but if desiring to employ the roots as regular grafting stocks for French vines, it becomes necessary to graft them simply as rooted nodes or cuttings.

44.—SIMPLE AND DOUBLE LAYER GRAFTING.

In this case the work within doors is interrupted, and, unable to bring the mountain to us, we must now go to the mountain; or, in other words, we must seek the vine in the field or out of doors. The Champin graft is equally applicable in the open air, either to unite the cutting or scion to the old trunk; or the resistant cutting may be affixed to a cane, and to this the desired variety, grafted as indicated in numbers 28 and 29, Figure 38, *F*, and Figure 39, *F*, using, however, the Champin graft.

45.—GRAFTING THE VINE IN PLACE.

Grafting the vine in place is favorable to the use of many kinds of grafting, but particularly to the Champin graft, because it possesses double the chance of taking on small

46.—ABOVE GROUND WOODY AND HERBACEOUS GRAFTING.

I have attempted to graft the branches of an old vine, resistant

scions, on non-resistant branches and *vice versa*; further, I have had them take, but in such small proportion that the success of the method remains a question involving principally the value of the grafting wax used. This method should be employed seldom, being of value only for experiment.

47.—LATERAL DOUBLE CLEFT GRAFT OF CUTTING ON ROOT.

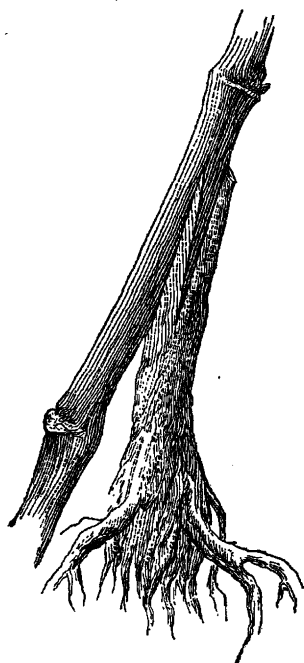


FIG. 64.

This is an ingenious application of my system, for making more certain the taking or rooting of the cutting of resistant stocks which may be grafted by this method (Fig. 64), either within doors or on the rooted young plant in place. It assures a vigorous growth of the resistant plant thus formed. If employed in grafting a non-resistant variety on a resistant, it possesses the advantage of allowing no roots to form on the graft above the point of union.

It may also be advantageously employed for grafting one resistant stock on another, where the second has already been growing in vineyard, and where it is desired to change the variety.

48.—LATERAL DOUBLE CLEFT GRAFTING ABOVE GROUND.

The advocates of my system compel me to give or explain its application to this purpose, so easily understood. (Fig. 65.)

I fail to see the application of this complicated lateral system to grafting non-resistant on resistant vines.

It is only reversing the saddle spur or *talon* graft, with the difference that the spur in that case is designed to produce roots, and in this case it utilizes a bud to form a branch, which branch, robbing the graft thus formed of an amount of sap, is eventually cut off at *P* (Fig. 65) and lost. The sap might otherwise go to nourish the graft.

It appears to me that this graft would be of use only in two cases: first, if one desire, as a matter of curiosity or interest, to make one plant bear a number of varieties of grapes and to obtain this result by above-ground grafting, which, by this double cleft is more assured of taking; second, when desirous of covering a trellis, as is done with pear or other trees, by bringing the canes together; this, however, can be better done by employing the

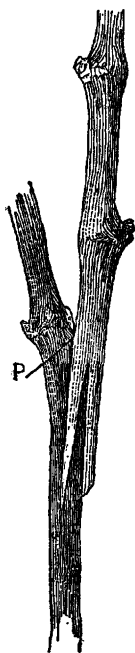


FIG. 65.

49.—ARCH GRAFT FOR REPLACEMENT,

Which consists in drawing a neighboring cane to the point of desired union, *I* (Fig. 66), and of grafting it at this place, perhaps by the end, as in Figure 48, if wished; may be by approach with simple incision (Fig. 11);

may be by approach by round incision (Fig. 36); may be by simple plain approach, or, it may well be, by

50.—GRAFTING BY SIMPLE INCISION.

This graft has been referred to twice previously—once for affixing roots to cuttings, *B* (Fig. 41), and again for one cane on another.

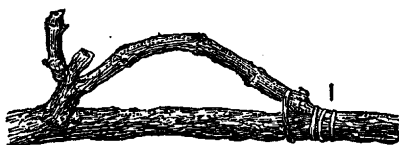


FIG. 66.

The Versadi graft, *G* (Fig. 42), of which I give an example, *I* (Fig. 66), will not need other explanation, its simplicity rendering it readily understood.

Now, if I were to enumerate and explain all of the combinations and modifications which occur in grafting by the preceding system, I could never hope to finish. When the grafter has before him the parts to be united he can always find new combinations, which are in a measure suggested and even demanded by the work in hand; others, too, will be suggested by the desire to invent and vary the ordinary systems.

I will finish this long and, of necessity, incomplete list of methods of grafting vines, by one, which, if it were not so long and complicated, would be the best of all.

51.—TRIPLE-CLEFT GRAFT.

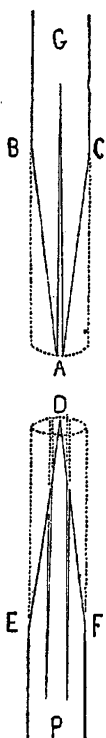


FIG. 67.

This method was suggested to me in 1878, at Carpentras, by an old grafter, whose name I have forgotten. He explained it to me, saying: "To the graft made I will add another tongue and cleft, which will augment the uniting surface and the solidity of the whole. I have employed and succeeded with this graft for terminal herbaceous grafting on resinous vines, which I have been unable to unite by any other method." He then proceeded with a sharp thin blade to split a tongue and then doubly split another, which, being joined, made a good union.

I myself have tried this perfected graft, but do not think it applicable for general use on a large scale. A recent letter from my distinguished friend M. Eugène Raspail, asserts that this method is perfectly successful with M. Rayband at L'Ange; and further adds, that a good grafter can do this as rapidly as he can employing the Champin graft. This last assertion I have reason to doubt, but my personal experience with it has induced me, after trying a great many other grafts, to recommend and to explain it as follows:

Split the graft *G* (Fig. 67) for a length of four or five times its diameter; then proceed to pare down the two sides, following the lines *B A* and *C A* to a point.



FIG. 68.

Make two clefts or splits in the part graft *P*, such that they divide it into three parts of equal thickness, and in such a manner as to injure the pith as little as possible; then whittle down the two sides, following the lines *E D* and *F D* in such a manner as to bring the middle part to a point at its middle, *D*.

Introduce, then, the three tongues into the three corresponding clefts and push them forcibly together, and the operation is done. If it were not for the need of tying in the projecting outside tongues, it would be sufficiently solid without any binding with a ligature.

It is only necessary to examine Figure 68 to see and appreciate the advantages of this graft. There are eight surfaces of contact, and these are as near parallel as possible. In fact, I believe there is no one who has followed me in this work who could not, appreciating the value of these elements in any system, guarantee the taking of a graft by the above procedure.

There are, of necessity, by this system, two naked spots or exposed places made, as with the Champin graft. But these surfaces, known to exist, though the terror of the grafter by the English system, are easily covered by a little clay, the bark following soon after. A long experience has taught me that the more these exterior tongues are suppressed the more the vine is disembarassed of useless and often injurious appendages.

But the principal advantage of this system has not yet been given, viz.: it diminishes greatly the chances of the scion rooting, and thereby freeing itself of the resistant stock. It is so clearly and completely surrounded and clasped by the lower part as to be scarcely able to put forth any roots.

If this method may ever be so rapidly done as to make it practicable on a large scale, as, for instance, by machine, such as has been invented for this graft by Mr. Leydier, it will render great service to viticulture, and be superior to all other methods, the Champin graft included, because it is the Champin graft perfected.

VII.—LIGATURES USED IN GRAFTING.

We have now passed through a number of the operations which belong to grafting; there remain still others, each of which I would recommend, as those we have passed, as important. I never fail to explain to each workman, whether he has to prepare the grafts or to split the plants to receive them, or whether he adjusts them, ties, waxes, or plants the grafted vine, the great importance of each particular operation. To prove that all parts of the work are equally important, we need only observe that if one be poorly done it compromises the whole work.

The ligature used in fastening the graft should be fine and strong. Some employ yarn, some wire, or may be rubber string, sometimes plain and sometimes prepared; rushes, bark fiber, sea-grass, mat-weed, linden, mulberry, willow or palm fiber, commonly termed "raphia," each of which has its advocates, from which I conclude that it possesses advantages.

I have always had poor success in the use of woolen yarn when grafting the vine in place. It is not tight enough at the time of grafting and becomes too tight afterwards.

With fine wire, which binds the graft perfectly at the time of operating, there is risk of strangling the plant soon after, for it is so small as to cut readily into the growing plant, and is not apt to yield. Being so fine, it soon becomes enveloped in the bark, and is therefore difficult to find or remove.

Rubber is often employed, and, by those who use it, highly spoken of. Not having used it, I am unable to say anything against it; but I doubt very much its value. Among other objections, it has a terrible enemy in the ant.

A small string does very well, though unnecessary trouble is sometimes incurred to make it more lasting. I believe it lasts long enough without any preparation.

Sea plants, grasses, etc., furnish a number of ligatures with which the southern grafters are very well satisfied. The bark fiber of trees and plants, such as the beach and the linden, when in threads, is used; that of the mulberry and the willow appears to be quite insufficient, inconvenient, and only serviceable for want of better.

As for me, I employ only raphia,—a species of herbaceous palm, which grows—I don't know where. The leaves, which are from three to six feet long, and from four to six inches wide, are of a pale yellow silky color, supple, soft to the touch, and of a strength which surpasses, when it is rolled and twisted, that of any of the other ligatures which I have mentioned.

Raphia has another advantage: it lasts indefinitely in the air, but in the ground it rots and disappears so quickly as to run no risk of strangling the wood, thereby is avoided the annoying and difficult operation of detaching it from the plant. This advantage in raphia becomes, under certain circumstances, an inconvenience. In the Spring of 1879, when all the atmospheric agencies concurred to render grafting unsuccessful, the raphia itself played its part among the damaging elements; and in place of lasting for a long time, and thus compensating for the retarding temperatures of the season, it rotted

quickly, and had to be temporarily condemned for having this time disappeared before it had completed its useful mission of allowing the parts to unite.

To remedy this difficulty the raphia should be plunged in a solution of sulphate of copper for a certain time, and thus made to endure long enough. In varying the quantity of sulphate of copper and the length of time immersed, there may be obtained for raphia a sort of chromatic scale of its resistance to rot in moist earth; then one may employ short, long, or medium time, according to the service for which it is designed.

Whatever may be the ligature used, it is necessary that it should be tied very tight—in fact, as tight as possible, and the turns, aside from the first and last two, should be left sufficiently apart to facilitate the waxing.

In commencing, the fastening should be tied by passing over itself, like a half hitch, and should be ended by a dexterous move of the finger in passing under itself once, or better twice, in order to make it a charvietier knot. (*N*, Figs. 13, 24, 60.)

The women, novices, and little boys are employed for the tying, it being one of the precious auxiliaries, but it is necessary to charge them often to tie it strong. To continue pulling and tying the strings to make them tight, throughout the day, is more fatiguing than one would expect. Others do not always have the chance that I have had in employing an old and experienced tyer, and should, therefore, never for an instant forget the necessity of having the new joint solid. On this I insist as much to my readers as to my workmen.

Between grafting and gathering the grapes the plants must pass through many trials; many obstacles there are to overcome, many dangers and enemies to avoid and vanquish. The most dangerous of all enemies in extensive cultivation, and that which it becomes most often necessary to punish, is the workman. If each good grafter could give to the grafted plant all of the care, labor, and operations necessary to complete the work, one might then rest assured of its being properly done. It would generate an affection like that for his children, whom, owing to the total responsibility resting upon him, he cares for in such a manner as to eliminate all danger. This can only be the case, the good workman doing all, with small plantings, and it is this which explains the marvelous successes obtained with small numbers, though the means be limited.

In proportion to the acres to be grafted, must the work be divided. Some must work at grafting, some at tying, some at waxing; some must carry the plants and arrange them; others must take them to the vineyard, others plant; others still must fill up the holes, keeping all busy with both hands and feet, and that by experts in their several departments, such that no necessary move, cut, tie, or motion may be neglected which would add to the solidity of the plant—for the vine in place, the work is never done. After having performed the above named operations carefully, to finish off, a new enemy appears, not less terrible and inevitable than the others, viz.: the wind.

To combat this it is only necessary that it be as tightly and as solidly put together as if it were only one piece. When my system is used, this is guaranteed in being conveniently adjusted, tied, and by nature attached (Fig. 63.) It is then as difficult to break, wrench, or

separate it as if it were all in one. From grafting to planting, innumerable causes there are to injure the work, which, if successfully avoided, become only a matter of gratification, and, once nature makes its union, there is no more danger of its breaking at that point than at any other.

VIII.—MASTIC USED IN GRAFTING.

At the risk of contradicting numerous theories, and without desiring, under any consideration, to dilate on the numerous manufactured articles used in grafting, I will assert that there is no wax or mastic at present known equal to clay.

I have already said that aerial grafting, when the sap is dormant, is possible with the vine, but very uncertain when applied on a large scale; the difficulty to which failures are mostly attributable is in the finding of a proper wax or mastic to be used. A wax specially adapted to the above-ground grafting of the vine has not yet been found.

The comparative studies and numerous experiments that I have made are too long to recount here; my conviction that certain resinous emanations prevent the consolidating of the parts would doubtless give rise to useless contradiction. All who have made a fair trial will agree with me that the only reliable and best mastic is clay.

I would, however, invite all viticulturists and manufacturers of mastics to engage with me in the solution of this problem: the finding of an ointment which will assure the uniting of the parts of an aerial graft. It would render an immense service to viticulture, and if I ever find the desired mastic my grafting confreres would soon become acquainted with the new discovery.

While waiting for the above we will be obliged to confine ourselves to grafting beneath the surface and the use of clay as a mastic.

Clay is fine, soft, unctuous, and, best of all, it is found at home. It is convenient to obtain at the time of grafting, though difficult to handle if too dry, and more so when too wet.

To augment the tenacity of clay we may follow the directions of Saint Fiacre, and add a little soft, green, and fresh vegetable matter, preferably cow manure, which may be picked up along the road.

A little salt and water, employed to give the mixture a proper consistency, will preserve it fresh and moist, by making it absorb moisture from the surrounding atmosphere.

This mastic is not dear, and it is not necessary to spare it, but it may be put on in sufficient quantity to last. In order that it should hold, it is best to put on two layers, perhaps using the fingers, perhaps a little wooden spatula, which is very serviceable if intelligently used.

The first time applying, little should be used; but it is necessary that it should enter every part and be pressed hard to make it connect and adhere throughout. If we put on too thick a layer at first, there is considerable risk of its not entirely surrounding the wood, thus allowing the entrance of the air, which would tend to dry and crack off a part of the mastic before planting. The second layer, if properly applied, removes all possibility of the air entering, the clay adhering easily to clay; the whole may thus be made half an inch thick.

The last precaution, which few grafters take, but which is a valuable one, is that of waxing the upper extremity of the graft.

When grafting on a stock, the buds of which are close together, thereby forming short internodes; it is best to have the upper cut of the graft as far as possible above the last bud of the graft. If cut close

to the bud from which we expect the vine to develop, the bud is very apt to dry out; I would recommend covering the scion, when grafted, with earth or sand. In any case, the upper bud is best preserved by applying some sealing material or mastic on the terminal point of the scion; said mastic should not be soft, and yet not subject to crack off or dry up. The ordinary grafting wax, as used on trees, would be suitable for this purpose.

ANNUAL REPORT
OF THE
STATE BOARD OF HORTICULTURE
OF CALIFORNIA,

CONTAINING

THE REPORT OF THE INSPECTOR OF FRUIT PESTS, AND ALSO THE FULL STENOGRAPHIC
REPORT OF THE STATE FRUIT GROWERS' CONVENTION HELD UNDER THE AUSPICES
OF THE BOARD IN THE CITY OF SAN FRANCISCO, NOVEMBER 20, 21, AND 22, 1883.

OFFICE: 40 California Street, San Francisco.



SACRAMENTO:
STATE OFFICE, JAMES J. AYERS, SUPT. STATE PRINTING.
1883.

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CHAPTER LXIII.

An Act to create and establish a State Board of Horticulture, and appropriate money for the expenses thereof.

[Approved March 13, 1883.]

The People of the State of California, represented in Senate and Assembly, do enact as follows :

SECTION 1. There shall be a State Board of Horticulture, consisting of nine members, who shall be appointed by the Governor: two from the State at large, and one from each of the seven horticultural districts, which are hereby constituted as follows:

First—The Sonoma District, which shall include the Counties of Sonoma, Marin, Lake, Mendocino, Humboldt, Del Norte, Trinity, and Siskiyou.

Second—The Napa District, which shall include the Counties of Napa, Solano, and Contra Costa.

Third—The San Francisco District, which shall include the City and County of San Francisco, and the Counties of San Mateo, Alameda, Santa Clara, Santa Cruz, San Benito, and Monterey.

Fourth—The Los Angeles District, which shall include the Counties of Los Angeles, Ventura, Santa Barbara, San Luis Obispo, San Bernardino, and San Diego.

Fifth—The Sacramento District, which shall include the Counties of Sacramento, Yolo, Sutter, Colusa, Butte, Tehama, and Shasta.

Sixth—The San Joaquin District, which shall include the Counties of San Joaquin, Stanislaus, Merced, Fresno, Tulare, and Kern.

Seventh—The El Dorado District, which shall include the Counties of El Dorado, Amador, Calaveras, Tuolumne, Mariposa, Placer, Nevada, Yuba, Sierra, Plumas, Lassen, Modoc, Alpine, Mono, and Inyo.

SEC. 2. The members appointed from each district shall be residents of the district from which they are appointed, and shall be specially qualified by practical experience and study in connection with the industries dependent upon horticulture. They shall each hold office for the term of four years, except that of the nine first appointed, four, to be determined by lot, shall retire at the end of two years, when their successors shall be appointed by the Governor.

SEC. 3. The Board shall appoint and prescribe the duties of a Secretary, who shall not be one of their number, and elect of their own number a Treasurer, both to hold office during the pleasure of the said Board. The Treasurer shall give a bond to the State, with sureties approved by the said Board, in the sum of ten thousand dollars, for the faithful discharge of his duties.

SEC. 4. The Board may receive, manage, use, and hold donations and bequests for promoting the objects of its formation. It shall meet semi-annually, and as much oftener, and at such places, as it may deem expedient, to consult and adopt such measures as may best promote the horticultural industries of the State. It may, but without expense to the State, select and appoint competent and qualified persons to lecture in each of the horticultural districts named in section one of this Act, for the purpose of illustrating practical horticultural topics, and imparting instruction in the methods of culture, pruning, fertilizing, and also in the best methods of treating the diseases of fruit and fruit trees, cleansing orchards, and exterminating insect pests. The office of the Board shall be kept open to the public, subject to the rules of the Board, every day, excepting legal holidays, and shall be in charge of the Secretary during the absence of the Board.

SEC. 5. For the purpose of preventing the spread of contagious disease among fruit and fruit trees, and for the prevention, treatment, cure, and extirpation of fruit pests and the diseases of fruit and fruit trees, and for the disinfection of grafts, scions, orchard debris, empty fruit boxes and packages, and other suspected material or transportable articles, dangerous to orchards, fruit, and fruit trees, said Board shall make regulations for the inspection and disinfection thereof, which said regulations shall be circulated in printed form by the Board among the fruit growers and fruit dealers of the State, shall be published at least twenty days in two daily newspapers of general circulation in the State not of the same city or county, and shall be posted in three conspicuous places in each county in the State, one of which shall be at the County Court House thereof. Such regulations when so posted shall be held to impart notice of their contents to all persons within this State, and shall be binding upon all persons.

SEC. 6. The said Board shall elect of their own number, or appoint from without their number, a competent person especially qualified by practical experience in horticulture, for the duties of his office, who shall be known as Inspector of Fruit Pests (to hold office at the pleasure of the Board), whose duties it shall be to visit the horticultural districts of the State, to see that all regulations of said Board and provisions of law to prevent the spread of fruit pests and

diseases of trees and plants injurious to the horticultural interests of the State, and all regulations of said Board in the nature of quarantining infected or infested districts, and also all rules and regulations of said Board concerning disinfection of fruits, trees, plants, grafts, scions, orchard debris, empty fruit boxes and packages, and other material dangerous to orchards, fruit, and fruit trees are enforced. He shall, also, whenever required, and under the direction of the Board, and may also upon his own motion, and upon the complaint of interested parties, inspect orchards, nurseries, and other places suspected, or believed to be infested with fruit pests, or infected with contagious disease injurious to trees, plants, or fruits, and he shall report the facts to said Board. If, upon report of said Inspector, or from well attested facts otherwise before it, said Board shall be of the opinion that any locality, orchard, district, or place is infested with fruit pests, or infected with contagious disease injurious to trees, plants, or fruits, and liable to spread to other localities to the injury of other persons or places, said Board shall by an order entered upon its minutes, so declare said and such infested or infected district or place shall be under the quarantine regulations of said Board. As soon, however, as in the opinion of said Inspector the danger from such locality has ceased, he may suspend said quarantine regulations, and shall immediately report the fact to the Board, who may approve or disapprove his action. He shall from time to time, and whenever required by said Board, report to it such information as he may acquire from observation, experience, and otherwise, as to the best modes of diminishing and eradicating fruit pests and diseases from orchards; and also suggestions in practical horticulture; the adaptation of products to soil, climate, and markets, and such other facts and information as shall be calculated to improve the horticultural interests of the State.

SEC. 7. The said Board, and, in case of necessity, during the recess of the Board, the said Inspector may appoint such quarantine guardians as may be needed to carry out the provisions of this Act, whose duties it shall be to see that the regulations of the Board and the instructions of the Inspector are enforced and carried out; they shall also report to said Inspector, or to the State Board, all infractions or violations of said directions, regulations, and of the law in regard to quarantine disinfection and destruction of pests, and precautions against the spreading pests and diseases. The salary of quarantine guardians shall not exceed two dollars per day, and shall be paid by the owners of orchards and other places and localities under quarantine regulations; and they may maintain an action therefor before any Justice of the Peace in any township in which any quarantined locality is wholly or in part situated. But in no case shall they have any claim upon the State for such services.

SEC. 8. It shall be the duty of the Secretary to attend all meetings of the Board, and to preserve records of its proceedings and correspondence; to collect books, pamphlets, periodicals, and other documents containing valuable information relating to horticulture, and to preserve the same; to collect statistics and other information showing the actual condition and progress of horticulture in this State and elsewhere; to correspond with agriculture and horticulture societies, colleges, and schools of agriculture and horticulture, and other persons and bodies, as he may be directed by the Board, and prepare, as required by the Board, reports for publication; he shall also act as assistant to and obey the directions of the Inspector of Fruit Pests in the exercise of the duties of his office, and shall be paid for his services as such Secretary and assistant a salary of not to exceed seventy-five dollars per month.

SEC. 9. The Inspector of Fruit Pests shall receive as compensation for his services not to exceed the sum of one hundred and fifty dollars per month, and his actual traveling expenses shall be allowed, not to exceed seven hundred and fifty dollars per annum; the other members of the said Board shall receive no compensation whatever.

SEC. 10. The Board shall biennially, in the month of January, report to the Legislature a statement of its doings, with a copy of the Treasurer's accounts for the two years preceding the session thereof, and abstracts of the reports of the Inspector of Fruit Pests and Secretary. Said report shall not exceed one hundred printed pages.

SEC. 11. The Treasurer shall receive all moneys belonging to the Board, and pay out the same only for bills approved by it, and shall annually render a detailed account to the Board.

SEC. 12. There is hereby appropriated for the uses of the State Board of Horticulture, as set forth in this Act, out of any moneys in the State Treasury not otherwise appropriated, the sum of five thousand dollars for the year commencing April first, one thousand eight hundred and eighty-three, and five thousand dollars for the year commencing April first, one thousand eight hundred and eighty-four, and the State Controller will draw his warrants upon the State Treasurer in favor of the Treasurer of said Board for the said sums, or any part thereof, when they become available, upon proper demand being made for the same by the said Board.

SEC. 13. This Act shall take effect and be in force from and after its passage, and all Acts or parts of Acts inconsistent or in conflict with the provisions of this Act are hereby repealed.

CHAPTER LXXV.

An Act to protect and promote the horticultural interests of the State.

The People of the State of California, represented in Senate and Assembly, do enact as follows:

SECTION 1. Whenever a petition is presented to the Board of Supervisors of any county, and signed by five or more persons who are resident freeholders and possessors of an orchard, or both, stating that certain or all orchards, or nurseries, or trees of any variety, are infected with scale bug, codlin moth, or other insects that are destructive to trees, and praying that a commission be appointed by them, whose duty it shall be to supervise their destruction, as hereinafter provided, the Board of Supervisors shall, within twenty days thereafter, select three Commissioners for the county, to be known as the County Board of Horticultural Commissioners. The Board of Supervisors may fill any vacancy that may occur in said Commission by death, resignation, or otherwise, and appoint one Commissioner each year, one month or thereabouts previous to the expiration of the term of office of any member of said Commission. The said Commissioners shall serve for a period of three years from the date of their appointment, except the Commissioners first appointed, one of whom shall serve for one year, one of whom shall serve for two years, and one of whom shall serve for three years, from the date of appointment. The Commissioners first appointed shall themselves decide, by lot, or otherwise, who shall serve for one year, who two years, and who three years, and shall notify the Board of Supervisors of the result of their choice.

SEC. 2. It shall be the duty of the County Board of Horticultural Commissioners in each county, whenever they shall be informed by complaint of any person residing in such county, that an orchard, or nursery, or trees, or any fruit packing house, storeroom, saleroom, or any other place in their jurisdiction, is infested with scale bug, codlin moth, red spider, or other noxious insects liable to spread contagion dangerous to the trees or fruit of complainant, or their eggs or larvæ, injurious to the fruit or fruit trees, they shall cause an inspection to be made of the said premises, and, if found infected, they shall notify the owner or owners, or the person or persons in charge or possession of the said trees, or places, as aforesaid, that the same are infected with said insects, or any of them, or their eggs or larvæ, and shall require such person or persons to disinfect the same within a certain time to be specified. If, within such specified time, such disinfection has not been accomplished, the said person or persons shall be required to make application of such treatment for the purpose of destroying them as said Commissioners shall prescribe. Said notices may be served upon the person or persons owning or having charge or possession of such infested trees, or places, or articles, as aforesaid, by any Commissioner, or by any person deputed by the said Commissioners for that purpose, or they may be served in the same manner as a summons in a civil action. If the owner or owners, or the person or persons in charge or possession of any orchard, or nursery, or trees, or places, or articles, infested with said insects, or any of them, or their larvæ or eggs, after having been notified as above to make application of treatment as directed, shall fail, neglect, or refuse so to do, he or they shall be deemed guilty of maintaining a public nuisance, and any such orchards, nurseries, trees, or places, or articles thus infested, shall be adjudged, and the same is hereby declared a public nuisance, and may be proceeded against as such. If found guilty, the Court shall direct the aforesaid County Board of Horticultural Commissioners to abate the nuisance. The expenses thus incurred shall be a lien upon the real property of the defendant.

SEC. 3. Said County Board of Horticultural Commissioners shall have power to divide the county into districts, and to appoint a local Inspector for each of said districts. The duties of such local Inspectors shall be prescribed by said County Board.

SEC. 4. It shall be the duty of the County Board of Commissioners to keep a record of their official doings, and to make a report to the Board of State Viticultural Commissioners on or before the first day of November of each year, who shall incorporate the same in their annual reports.

SEC. 5. It shall be the duty of the Commissioners at large, appointed by the Board of State Viticultural Commissioners for such purpose, to recommend, consult, and act with the County Boards of Commissioners, in their respective counties, as to the most efficacious treatment to be adopted for the extermination of the aforesaid insects, or larvæ, or eggs thereof, and to attend to such other duties as may be necessary to accomplish or carry out the full intent and meaning of this Act.

SEC. 6. Each County Commissioner and local Inspector may be paid five dollars for each day actually engaged in the performance of his duties under this Act, payable out of the county treasury of his county; *provided*, that no more shall be paid for such services than shall be determined by resolution of the Board of Supervisors of the county for services actually and necessarily rendered.

SEC. 7. Each of said Commissioners may select one or more persons, without pay, to assist him in the discharge of his duties, as he may deem necessary.

SEC. 8. If any County Board of Commissioners, after having received complaint in writing, as provided for in section two of this Act, shall fail to perform the duties of their office, as required by this Act, they may be removed from office by the Board of Supervisors, and the vacancy thus formed shall be filled in the same manner as provided for in this Act.

SEC. 9. Nothing in this Act shall be construed so as to affect vineyards or their products.

SEC. 10. This Act shall take effect immediately.

THE OPINION OF THE ATTORNEY-GENERAL

ON THE

VALIDITY OF THE COUNTY HORTICULTURAL LAW.

OFFICE OF THE ATTORNEY-GENERAL OF THE STATE OF CALIFORNIA, }
SAN FRANCISCO, September 3, 1883. }

S. F. CHAPIN, ESQ., *Inspector of Fruit Pests*:

DEAR SIR : It is my opinion that the Act of 1881, entitled "An Act to promote the horticultural interests of the State," is not repealed by the Act of 1883, entitled "An Act to create a State Board of Horticulture," there being no conflict between the provisions of said Acts. There is no reason why the County Boards of Horticultural Commissioners should not exercise all their powers and discharge their duties under said Act of 1881, so far as the same do not conflict or are not inconsistent with the powers conferred upon the State Board of Horticulture by the Act of 1883.

Very respectfully,

E. C. MARSHALL,
Attorney-General.

REPORT OF THE SECRETARY.

To the President and Members of the State Board of Horticulture:

I herewith present to you a brief report of the work of this office up to November first of the current year. The present State Board of Horticulture was created by an Act of the Legislature approved March 13, 1883. It provided, among other things, for the appropriation of \$5,000 for the year commencing April 1, 1883, and \$5,000 for the year commencing April 1, 1884.

It created seven horticultural districts in the State, each entitled to a Commissioner, and two Commissioners from the State at large, all to be filled by executive appointment.

The Governor appointed on that Commission the Hon. A. F. Coroneel, of Los Angeles, and Dr. Edward Kimball, of Alameda County, as Commissioners for the State at large, and General M. G. Vallejo for the Sonoma District, Wm. M. Boggs for the Napa District, Dr. S. F. Chapin for the San Francisco District, Ellwood Cooper for the Los Angeles District, Hon. H. C. Wilson for the Sacramento District, G. N. Milco for the San Joaquin District, and Felix Gillet for the Nevada District.

On the organization of this Board (although a former one, under a previous law, had existed, and which I am pleased to state accomplished great good to the horticultural interests of California), there was actually nothing in the nature of office furniture, nor any books, papers, etc., on the subject of entomology and horticulture, with the exception of the report of the ex-Chief Executive Officer for the year 1882. Of this report, however, there was an abundant supply.

Nor was there to be obtained an idea of the names and address of those who are and have been interested in fruit raising in this State, from any record of such, for the new office. Hence you will perceive how difficult it has been to get the office in an intelligent and successful working order. I take pleasure in informing you, however, that in the short space of seven months, I have been enabled to procure the names and address of nearly all those interested in horticulture in California, and as to those who have been omitted, it has been unintentional. For much of this information I am indebted to County Assessors for their kind and willing assistance in furnishing me the names and address of fruit growers of their respective counties, while I regret to say that some few have utterly failed to respond to my request for such information.

Notwithstanding all these difficulties, I have now on my books the names of a great many of the most intelligent and enterprising of California's horticulturists, to whom I have forwarded the late circular of the Inspector of Fruit Pests (which none can fail to appreciate), and nearly three thousand invitations to this Convention, besides hav-

ing written many letters to persons in the East, as well as in the different sections of this State, making and answering inquiries on this most important subject. In all this work I have been greatly assisted by the members and officers of the Board, and in the matter of collecting names to whom valuable information in the form of printed matter is to be forwarded from time to time, I have been materially assisted by our present Inspector of Fruit Pests, who, in his many trips throughout the different sections of the State, in the inspection and investigations of the many important interests assigned to that officer, has kindly and industriously collected a most valuable list for my office.

In this connection it may be proper to state that owing to the provisions of law respecting the mode of drawing funds from the State Treasury for the support of this office, it has been necessary for the Treasurer of the Board, Gen. Vallejo, to make frequent visits to this office on official business, and as the law provides no compensation for that officer, it has been necessarily at his own personal expense. This applies, also, to all the members of the Board (except the Inspector of Fruit Pests), as the law does not even allow their necessary traveling expenses, some having to travel hundreds of miles to attend the meetings and transact the business of the Board. This difficulty, I doubt not, the next Legislature will take pleasure in remedying with appropriate legislation.

On the fifth day of April last, the first meeting of the Board was held in the parlors of the Capital Hotel, at Sacramento City, at which there were present: Commissioners Vallejo, Chapin, Boggs, Coronel, Wilson, and Gillet, being a quorum. Its organization was perfected by the election of Wm. M. Boggs as President of the Board, and also as Inspector of Fruit Pests; Dr. S. F. Chapin, Vice-President; Gen. M. G. Vallejo, Treasurer, and A. H. Webb, Secretary. Mr. Felix Gillet subsequently resigned the office of Commissioner for the Nevada District, and Mr. N. R. Peck was appointed by the Governor for that district.

At the meeting of the Board, at their office, No. 40 California Street, San Francisco, April 26, 1883, Mr. Wm. M. Boggs tendered his resignation of the office of Inspector of Fruit Pests, which was accepted, and on motion of Mr. Boggs, Dr. Chapin was unanimously elected to the office.

At the meeting of the Board, July twenty-seventh, President Boggs tendered his resignation as President of the Board, which was accepted, and Mr. Ellwood Cooper was elected President.

At a meeting of the Board on the twenty-fifth of October, a call was issued for the holding of a State Fruit Growers' Convention, to be held under the auspices of the Board, in San Francisco, on the twentieth, twenty-first, and twenty-second of November, 1883, in San Francisco, the full report of which will be found herewith.

The following expenditures have been made up to November 1, 1883:

For April and May.....	\$944 36
For June.....	328 00
For July.....	292 50
For August.....	412 25
For September.....	275 20
For October.....	409 50

Total for the seven months of the year.....\$2,663 81

The expense of furnishing the office with furniture and carpeting amounted to \$362 21. This expenditure in that line will answer for many years to come.

All of which is respectfully submitted.

A. H. WEBB,
Secretary.

THE PROGRESS OF THE ORCHARDS OF CALIFORNIA DURING 1883.

By S. F. CHAPIN, Inspector of Fruit Pests.

[Read before the Third Annual State Fruit-Growers' Convention at San Francisco, November 21, 1883.]

Gentlemen of the State Board of Horticulture and Members of the Convention:

This statement of the work done in visiting the orchards of the State during the season can be but brief. I have endeavored to inspect the condition of the orchards in most of the prominent fruit-growing localities, yet, from lack of time, have not accomplished this purpose fully. I may say that, as a rule, wherever I have been I have found the orchardists making diligent efforts to suppress the various insect pests that have, during the past few years, caused so much annoyance and loss to the fruit interests. Generally speaking, people are alive to the importance of this subject, and I can record but one instance where I have not been courteously received in my official character. Invariably there is a willingness and desire to ascertain the progress made and the most approved methods for the treatment of these pests. Most orchardists are aware of the chief enemies of the fruit growers, and, from the publicity given to the subject, have become, to a great degree, familiar with the damage wrought by them. The different insect pests may be found now spread pretty well over the State, so that it is far easier to enumerate the fruit-growing localities where certain pests do not exist than to name the places where they are to be found. Some of them are found in almost all localities, and certain of them will find a home in one region and be unknown in other parts. One of our greatest obstacles is in the fact that the pests spread gradually, and do not attract attention until a foothold is secured and it is too late to succeed in the effort of *extermination*; consequently *suppression* becomes the only available resource. It may be an impossibility to exterminate certain of our pests, but one notable effort to accomplish this, in the case of codlin moth, will be mentioned further on. If in the face of all this spread of pests it is asked if good is being accomplished, the answer can be made that a great work is being done, and the season has witnessed cheering results.

The *Canker Worm* has, probably, been confined to narrower limits than any other of the various pests. Its damages have been done entirely in a few orchards in Alameda County. In 1881 and 1882 the

injury caused by defoliating the trees was very great, and the crop of fruit upon the infested trees was destroyed. Every effort was made in fighting the enemy, and a careful and systematic use of remedies carried on. This year, in a portion of one large orchard, by the previous use of arsenic—three pounds to two hundred gallons of water—the worm was destroyed, and a fine crop of fruit secured—at least one that promised well at the date of my visit. In other orchards the worm has been stayed by various causes, to some extent unknown, but in one case in part attributed to the flooding of the orchard in April, and thus drowning a large number of the pupæ. The owner thinks that had the flooding been done in December it would have killed nearly all the pupæ. Yet, but a couple of miles away, where a badly infested orchard of last year has shown but little damage this season, no flooding had been done.

Caterpillars have caused but little trouble this season where for some years they have been a most serious pest, the efforts made to exterminate them having succeeded admirably. In perhaps the most serious case, where for three years no apples were raised, this year a magnificent crop has been produced. Mr. De Long, to whom I refer, has been greatly assisted in his work by a parasitic fly. His great care to destroy eggs has, however, brought him through in safety.

The loss by the *Pear* and *Cherry Slug* has been inconsiderable where it has previously given much trouble. The simple remedy of throwing up and over the tree finely powdered dirt of the orchard has usually succeeded.

The *Pear-Leaf Caterpillar*, which is a small, green worm that eats the leaf through and has caused great damage in some orchards, and to be found in many parts of the State, has been most effectually treated in the way of washing at the Oakshade orchard, Davisville. The preparation used is as follows: Tobacco stems and leaves boiled down strong, and the liquor mixed with thirty pounds whale oil soap, ten pounds best sulphur, three pounds concentrated lye, and all this with one hundred gallons hot water. This was, in April, sprayed over the trees three times, and with the best results. The trees were at the time of my visit in July in perfect health, making a most vigorous growth, and loaded with a fine crop of fruit.

The *Saw-fly* of this caterpillar has, in Santa Clara County, appeared in the latter part of July in immense numbers, and in one large orchard of pears a remarkable result was obtained in catching the flies. This was by means of a preparation put out for another and entirely different purpose, viz.: that of sweetened water in cans for catching the codlin moth. My examination of this orchard on July thirtieth, showed in all these hundreds of cans an immense number of these saw-flies, making, together with many large moths, an almost solid mass. Therefore, for this particular purpose, where trouble is caused by this fly, I would recommend the use of these cans partially filled with the above mentioned solution: Molasses, one part; vinegar, two parts; water, five parts. To be put out in the trees early in the Spring before the leaves appear. This will, without doubt, prove equally as attractive to the other saw-fly of the pear slug.

The *Borers* have caused some damage in localities, but, as a rule, are easily managed.

The different *Aphides* have been rather more prevalent than usual this year, attacking early in the season the leaves and new growth of

different trees, apple and pear trees in San Diego, the plum in Fresno and Hanford, the cherry in Grangeville, and the peach in many localities. It has disappeared as suddenly as it came, however. A species affecting the California black walnut, at Haywards, is more lasting in its effects, being so serious as to, in reality, spoil this beautiful tree for shade. This trouble has been observed in no other locality.

The *Woolly Aphis* has this season in many localities been worse than usual, and in other places, not the ordinary trouble has been experienced. Reports of great trouble have come from some counties, making orchardists feel that unless a remedy should be found it would result in being, as one in Butte County expresses it, "at this rate, simply a matter of time when our apple orchards will be ruined." Many of the oldest apple orchards in the State are so badly infested that it would be really the best to dig the trees out and burn them. In some young orchards, vigorous and healthy heretofore and well cared for, this pest has made great strides this season. One writes as follows from Bakersfield :

I find the Woolly Aphis making fearful ravages in some orchards. One, in particular, I want to call attention to of about five or six acres in a high state of cultivation and beautiful trees. I examined thoroughly a year ago, could detect no trouble; repeatedly since been through the orchard, and always kept an eye to insects, and never detected anything. Roots, limbs, and body seemed to be smooth, clean, and free of knots. A few days ago the owner sent for me to come and look at it, and I found the aphid had full possession. Seemed to start in one corner and go diagonally through from southeast to northwest with the wind; the further from the corner the lighter. It is a pitiful sight. Every knot, crevice, and crack is white and many bunches on the limbs higher up. The orchard is eight years old. No other orchard but my own within four miles of it, and both those healthy, apparently, and it until two weeks ago. Is it possible it could have been lurking in some tree overlooked, and made these strides in so short a time? Might an old box that had contained apples impregnated that corner? What is best to do, and save the trees if possible?

Well might this County Commissioner speak of the ravages of this insect, and ask these questions. There have many remedies been suggested, some succeed at times, and fail at other times. Probably as good a remedy as can be used is that of caustic soda in strong solution, about one pound to one gallon of water, applied to the collar of the tree, and large roots near the earth having been pulled away for the purpose. Mr. Cooper has used this wash successfully. During my visit to his orchard I could discover no trace of the insect. During a recent visit to Santa Cruz, on the premises of Mr. Pilkington, an old orchard was inspected, the work done in which would encourage the advocates of allowing hogs to run at will in the orchard. In this case a few trees were fenced off with some vines so as to allow hogs to run in the main orchard. Previous to this all the trees have been badly and equally infested with this pest. This season, however, the trees where the hogs have run have shown no aphid, while those kept from the hogs have been and are now infested. The hogs have rooted at will, and have uncovered the large roots near the trees, and, it is evident, have done much to lessen the evil. The result in this case would seem to prove that but one species infest both roots and top. Lime placed in excavated spots about the tree, and allowed to come in direct contact with the infested roots, is recommended. Mr. Cooke has seen the best results from this in some cases. Also the same with wood ashes and tobacco leaves and stems is to be advised.

It is likely we will never be freed from this pest until we can secure

some resistant stock upon which to work the apple. It is extremely rare that this insect attacks the pear, but I have in a few instances noted it. It is well here to call attention to the necessity of thorough cultivation, and to the use of fertilizers to keep the trees in as good health as possible. General Vallejo calls particular attention to the use of well rotted manure, and states that before the American occupation of California there existed very fine peaches. They were all seedlings. It became the practice to use fresh cow manure about them, and the result was disastrous, favoring the introduction of diseases, and so soon destroying the trees. He lays special stress upon the use of only well rotted manure.

The *Red Spider* has given some trouble during the season, but not so much as in some previous years. I have found it in almost every fruit-growing locality. Among the remedies employed this season I have made numerous experiments with whale oil soap and sulphur mixture, with strong alcoholic fluid extract of tobacco, prepared at Louisville, Ky., with fluid extract of pyrethrum (buhach) and other materials, such as soda ash, etc., and these in different combinations and various degrees of strength. Of these various preparations the following may be used: whale oil soap and sulphur mixture, three pounds; fluid extract tobacco, two pints; fluid extract buhach, two ounces; hot water, four and one half gallons, mixing and using hot. This may be applied now and again in the Spring. Mr. D. D. Hudson, manager of the Fresno Vineyard Company, told me that on this place last year the red spider was very bad. His treatment was by washing in the Autumn, while the foliage was still on, with concentrated lye one pound to four gallons of water. This did not seem to harm the trees at all and has resulted in cleaning the trees from the pest, as no spider can be found upon them this season. Another species of mite (yellow) has been troublesome in some localities, attacking trees in Summer, usually in August, and spinning a web, curls up leaves and causes great damage. It fortunately does not last long in the season. Messrs. Lewis, of Fresno, and Thomas, of Visalia, told me that they had successfully combatted them by spraying with cold water simply.

The *Diabroticas*, particularly the *Twelve Spotted*, does considerable harm, eating leaves and tender wood, and commencing on the nearly ripe fruit eats into it and spoils it. The apricot suffers more damage than any other fruit. It not only does this work on deciduous fruits, but, as Dr. Hays, of San Luis Obispo, writes, it causes much harm by eating the green shoots of the orange trees. A mixture of air-slacked lime and ashes thrown over the trees is offensive to this beetle, as is also smoking or smudges. A good method is that of using manure for material for burning under the trees where the diabrotica is feeding and upon this putting a mixture of one pound of sulphur and one ounce of powdered buhach. A preparation of buhach has been used in Sacramento, as mentioned in Mr. Cooke's book, composed of six pounds of buhach steeped in one gallon of alcohol, then diluted with twenty gallons of water and spraying it upon the trees. This, it is stated, destroyed the pests very effectually.

Grasshoppers have this season done much harm in a few localities defoliating trees and vines. One gentleman writes, July second, from Easton, near Fresno: "My orchard skirts my alfalfa fields. When the alfalfa is mown the grasshoppers, which are very numerous in the alfalfa, take to the trees, not only eating the fruit, but stripping

the trees of all leaves, and eating into the bark." Another gentleman writes from Pasadena, July ninth: "The grasshoppers have destroyed the foliage on about five hundred of my trees, and all my vines, two thousand." They made their appearance with so little warning that he was taken unprepared. He further says, "that the grasshoppers show a preference for apples, pears, and lemons. As yet apricots are little touched, and peaches half defoliated." In such cases it would be well to try the remedy under the head of diabroticas.

Rabbits and squirrels eating trees; not all our pests are confined to insects. I receive letters of complaint concerning the damage wrought upon young trees by these nuisances, and one legal gentleman writes asking information as to remedies, and closes with the question: "Will we never have an enforceable squirrel law?" Allied to these are the underground enemies, particularly gophers, which cause an immense deal of damage.

The *White Ant*, another serious underground enemy, has done great mischief in a few cases. I have received information that an orchard at Mountain View has been very seriously troubled, and at this time many trees have been lost. The pest attacks the tree just underground, and girdles it completely. The best remedy is the application of pure whale oil soap about the collar of the tree.

The *Curculio* has not reached this State. Thomas Meehan says: "They seem to be marching westward, however. On some wild plum bushes, along the streams, near Mandan, Dakota, all the fruit had been attacked by the insect."

The different *Fungi* cause much trouble in localities. In some places the apricot is so badly damaged by a fungoid growth upon the fruit as to be worthless. This exists in many counties, and specimens have been sent me that were completely ruined by this growth, and so not even good for drying. The pears, in some localities, so suffer from arrested development and disorganization of the tissue of the fruit as to make it impossible to grow them. This is the case about Watsonville, in the Pajaro Valley, where for several years no trees of some varieties have matured perfect fruit. In many parts of the State there may be found some of this, but not usually so as to ruin the fruit. In some cases this work has been thought to be the work of insects, *Haltica Chalybea*, but it is purely a change of tissue. In the East, in some localities, growers of pears have secured a smooth and healthy surface to the pear, of certain varieties usually badly affected, by heavy watering. They do this by digging holes large enough to contain several gallons of water at a proper distance from the tree. It is notable here that the worst cases of pear disease occur where they *do not* irrigate. Usually in *irrigated* regions the pear does well in this State. This Autumn I have found at Montecito, Santa Barbara County, and at Haywards, one orchard in each place, a fungus upon the leaves growing upon the underside of the French prune and some plums. This I have not noticed before in the State. Specimens sent to Dr. H. W. Harkness, so well known as an investigator of the different fungi, were pronounced by him to be the early stage of *Uromyces Prunorum*. He had first found it in an orchard in Yolo six years ago.

Mildew is common and frequently causes much damage. Of late a solution of carbonate of soda, two kilogrammes in a hectolitre of water, which is about four pounds to twenty-six gallons, has been

found to be very useful sprayed upon affected vines. It would be well to try this upon the mildew of our trees.

Peach Tree Blight.—I have received numerous letters from different portions of the State concerning a blight upon the peach trees. This trouble exists upon the Santa Cruz mountains, in Yuba County, upon the Sacramento River, in Ione Valley and vicinity, and perhaps other places. It has become to peach growers in those regions a somewhat serious matter. Mr. A. Loomis, President of the Santa Cruz Mountains Fruit Growers' Association writes:

In some localities here the peach trees especially are badly affected with what they call "gum blight," and in some instances the trees are dead or nearly so. It commenced with the young wood and that which was the least matured and gradually transmitted to the whole tree. The branches are covered with particles of gum. The trees seem to be affected most in the coldest spots and where they are most exposed to cold currents of air. My opinion is that it is caused by sudden changes of the weather after sap commenced to flow.

Last Winter he says was the coldest for some years, and four years ago, after a very cold Winter, the peach trees were some of them affected in the same way. The effects were similar in other cases. At Ione some were disposed to attribute the trouble to the work of insects. At the time of this trouble I had no opportunity to personally observe these trees.

A peculiar apple tree blight has attacked trees in certain portions of the San Joaquin Valley. At Fresno in the Central California Colony, at Visalia, and at Grangeville this disease was noted. It affects the limbs of the trees, denuding them of all foliage in the smaller branches, and then causing death. Some apple trees also show a gumming and gluing of the bark and death in spots.

The Peach Moth (Anarsia Lineatella).—This moth has for two seasons caused considerable loss to peach growers in a few localities, while in others it has done but little damage. It has been supposed that it had existed in the State but three years; but I was informed by a prominent fruit grower at Vacaville that he had observed it in his orchard for twenty years, causing but slight damage. At the Natoma orchards, Folsom, the insect was observed this season and its habits noted. Mr. W. H. Tucker writes as follows concerning it, July 16, 1883:

Observations on a new pest appearing on plums, peaches, apricots, and nectarines: A worm, sharp at both ends, varying from one quarter to three quarters of an inch long, unusually active, alternate brown and white rings, and not known in the State annals or records of fruit pests. First noticed on peach trees, on the buds near the ends of tender shoots; bored down he pith for three or four inches until near older wood, then came through and out, and disappeared. Nothing seen of them again until apricots ripened, when discovered on the fruit, going in from the stem and boring into the pit when it split, and when not split, going around, boring out to surface, and disappearing. In July were noticed boring into peaches, apricots, nectarines, and all varieties of plums, boring into side or end indiscriminately, ruining it, and coming out to surface to disappear, and apparently being greatly satisfied when they could find a pit split, taking up their quarters for a longer time therein. Apparently short-lived, and reproducing itself several times during the season. July twenty-fifth: We have found them hibernating under the rough ends of bark of trees, generally high up, and never (so far) low down, which would indicate that they *crawl down* the branches of trees, unlike the codlin moth, which drops down and crawls up to hibernate. We have also found it hibernating in a split pit of peach, and even in the meat of the peach, when it had left the stone and was making for the outside of fruit, and turned to chrysalis before reaching the rind. It has also been found (under glass) to come out of the fruit a lively worm and within twenty-four hours enter chrysalis state on the side of the glass cover. We have observed it to hatch out after eight days into a living moth of dark iron gray, a little smaller than the codlin moth, say one half to five eighths of an inch long, and much larger on the first day than the cocoon. We have not yet noticed the length of time between the broods, but have noted that this (July 25, 1883) is the third brood of the season.

During my visit there, I ascertained that this insect had caused a loss of ten per cent of early peaches, Hale's early, and Alexander, and five per cent of apricots and nectarines. The late peaches were not troubled; the moths not having been seen since August first. The larvæ go into pupæ in fruit or any hiding place on the tree. They were found under bands and above and below them. Where five bands had been placed on one tree they were found in all of them. So far as can be judged now the best treatment would be the full pruning in the Winter, and the Summer pruning or pinching off through the season, and burning the portions removed.

The *Codlin Moth*.—The ravages of this insect have been noticed in almost every fruit-growing district in the State, the extensive losses from which you have often considered. The spread of this pest from its first introduction to the State at Sacramento, nearly ten years since, has been steady and rapid, until now it is known by its work to almost every person who uses the fruit it infests. The important consideration now before us is the most effectual means of ridding ourselves of its presence. These various remedies are now pretty well understood. The one about to be adopted at San Diego would be the sovereign cure could it be unitedly and universally agreed upon. However, that would seem quite difficult of accomplishment. I refer here to the stamping out or starving out process by the destruction of the fruit upon which the larvæ feeds early in the season. At a very interesting meeting which I attended at San Diego, on October twentieth, this course was resolved upon in the infested districts of that enterprising county. Can they carry this resolution through they will have done what no other community ever accomplished in that particular, and we should give them, by our hearty approval, the encouragement they need. As this moth is the special enemy of the apple, pear, and quince, it is extremely rare that it attacks other fruits. So rare is this the case that in my own experience, after a careful accounting of more than thirty thousand larvæ, during two seasons, in but three instances was this larvæ found in other fruits, viz.: in one apricot and two peaches. Such percentage is extremely small.

Regarding the means of suppression I can offer encouragement from the observations of another season. Where the really vigorous and systematic effort has been made good results have been attained. It should, however, be noted, that those who are not willing to make an enterprising and constant warfare upon this insect, should not engage in the culture of apples and pears. A few instances of quite effectual work upon a large scale may be mentioned to buoy up our hopes and keep our interest from flagging. One very important fact observed this season is that the greater part of the loss has occurred during September. It should cause us to use every effort to destroy the earlier broods. In the largest apple orchard of California the work done this season has resulted in saving the larger portion of an immense crop of fruit. The great moth trap, where many thousands of moths (not larvæ) had been caught and killed up to the time of my visit, July twenty-eighth, has prevented damages to a high degree. Mr. De Long will no doubt give statements of his work. In the Oak-shade orchard, before mentioned, the wash used for the destruction of the green pear caterpillar had apparently from its early and frequent application prevented the moth from laying its eggs upon the fruit. Mr. Treat writes that he has but very few of the codlin moth this

season. This spraying, it will be remembered, was done early in April and thrice done; again, the vigilance exercised and the careful work done in the Natoma orchard has been most encouraging. Where the crop of thirty acres of Bartlett and Winter Nelis pears had previously been almost entirely lost, this season the loss has been reduced to a very small per cent. Here the different means advised in the circular to fruit growers had been carried out. In January the trees had been washed with caustic soda, one pound to two and one half gallons of water, to a depth of six inches under ground, where upon the trunk of the tree large numbers of larvæ were found. Also, when the fruit had reached the size of marbles another washing was given, using whale oil soap, twenty pounds; sulphur, six pounds; concentrated lye, two pounds; water, forty gallons. The infested fruit was carefully picked from the trees, the bands were scrupulously attended to, all fruit gathered from the ground, and the whole work done in such manner as to tell in the grand result. The work carried on in one of our oldest and largest apple and pear orchards of Santa Clara County merits attention from its results. I referred to this orchard in my report last season. The same plan has been carried out this year and the owner tells me that he has been quite successful. At various times while visiting there I have watched the work with great interest. In this case the loss has been in total about twenty per cent; on apples, chiefly the late varieties, twenty-five per cent, but with pears only five per cent. He has also used cans with sweetened water, as before alluded to in this paper, in which he caught some codlin moths, but the cans were chiefly filled with other moths and flies. I would by all means advise the use of this as well as the other different means used, but I would caution fruit growers to be careful how they make that their *only* dependence. I have observed its use in many orchards this season and have made careful examinations in all such cases to ascertain what proportion of moths were codlin. I have found in but very few instances any codlin moths. Sometimes one or two moths of that species were found. The greatest number found in one can was *three* and that but once. In an extensive apple orchard in Sonoma County, well known to you all, I found that all these various means of suppression, including the cans, had been carried on, and the crop, though a light one, a most healthy one.

There have been noticed in a few localities some insect enemies of the codlin moth. Mr. De Long has noticed these, as he yesterday informed me. I have also learned from my children that they have found a considerable number of the same larval enemy occupying the cocoons of the codlin larvæ in which no pupa case was found. These larvæ, in size, were very much like the codlin larvæ, but had many legs, and were brownish on the back. Dependence on the work of these parasites and enemies, should not, however, take the place of other efforts by the orchardists. In my orchard the work done this season has been carried out with the same care and particularity that I reported so fully at the last Convention. The peculiarities of the visitation of the codlin larvæ can best be shown by tabular presentation:

Eight hundred and fifty trees, bands applied May 12, 1883:

EXAMINED.	Larvæ in Bands.
May 19.....	0
May 26.....	8
May 31.....	8
June 9.....	2
June 20.....	65
June 27.....	159
July 6.....	555
July 13.....	523
July 23.....	547
July 31.....	463
August 6.....	246
August 13.....	230
August 20.....	241
August 28.....	426
September 6.....	1,117
September 15.....	1,073
September 22.....	1,657
September 29.....	2,262
October 6.....	170
October 13.....	76
October 20.....	21
November 3.....	0
Bands removed.....	3
	9,852

Infested fruit picked from trees, estimated up to August 28, 4,150; infested fruit gathered from ground, estimated to time of harvest in September, 2,500; infested fruit at harvest, 20,000; cost of picking infested fruit and examination of bands, \$41.

As accurately as can be figured, the loss upon the entire crop is nineteen (19) per cent, and of this, as per tables, three fourths occurred during September. A question is here presented. Out of twenty-six thousand, in round numbers, infested apples, ten thousand larvæ were caught in the bands; where were the balance? The larger number were in the infested fruit when gathered from the trees and taken up from the ground and then destroyed. Yet it would still leave some unaccounted for, and these must have gone into the ground chiefly, as will be seen from further statements, and some of them upon the trunk of the tree beneath the surface. These observations have been made during the season: through the entire season the infested fruit picked from the outside row, and at each end of the orchard contiguous to this row, has been more than double that found in any other portion of the orchard. This has been the case, also, with the larvæ found in the bands. At harvesting, this same fact was shown. This great difference is accounted for in this way: on my northeast corner, though some distance away, is a very badly infested and uncared-for orchard, and also on my southeast one, which previously had not troubled me, but this year supplied great numbers of moths. These old trees, I am happy to say, are now being dug out, as they are worthless. In one instance this season I found in one apple, at the same time, four larvæ of different sizes. This is the only case I know of where so many have infested one apple. As showing the efficacy and great value of the burlap bands, of the large number caught during the entire season, but five larvæ were found in cocoon *above* the bands, also one crawling worm and two empty pupa cases. A considerable number were found

below the bands and also upon the trunk under ground, but they were chiefly in and under the band itself. From the results obtained by this cheap and simple material, it is difficult to conceive that woolen cloths or other expensive materials could be more effectual. October sixth and thirteenth—After harvesting, the two hundred and forty-six larvæ found were almost wholly on the trees under which the apples in boxes were temporarily placed while picking, although speedily removed from the orchard. This shows how useless it is to remove bands before or even at the time of harvesting, unless the apples are *immediately* carried away from the vicinity of the trees. The bands were kept on until no more larvæ crawled. Then they were removed and burned. I shall this Winter carefully remove the earth sufficiently to wash the trunks of trees a few inches below the surface.

In the Press and Horticulturist an article from Mr. Gillet alluded to a supposed expression of mine that the cold weather of Winter would destroy the codlin moth. I have no recollection of ever having used such expressions, as I never have held such views. The only possible statements that could be so construed might have reference to the fact that the severe weather had affected the fruit crops so as to lessen the chances for the full propagation of the moth.

SCALE INSECTS.

With most of these I will ask you to spend but little time.

The *Black Scale* is to be found more particularly all along the coast of California, wherever there are citrus fruits or olives. It as well attacks deciduous trees, more particularly the apricot in the southern coast counties. It does not flourish upon orange trees in the interior hot counties. Few can be found in San Bernardino County. It is usually so bad upon olive trees, through the south, that but two orchards that I know of, along the coast, have been so thoroughly and so successfully treated as to produce profitable crops of olives. One, the largest and best known in the United States, the owner, Mr. Ellwood Cooper, has rendered very productive and valuable. I wish also to mention the very valuable work done with this pest by Major Levi Chase in his orchard at Cajon Valley, San Diego County. The remedies used by these gentlemen, and first recommended by Mr. Cooper, were strong and hot solutions of tobacco. Mr. Cooper now uses a very cheap compound of caustic soda, grease, and tobacco that is worth giving in full: Place a lump of caustic soda the size of one's head in an iron kettle, the largest size used on a No. 9 cooking stove, then pour upon that the strongest decoction of tobacco (already prepared), adding gradually until the soda is dissolved, and the kettle nearly full, then add grease (mutton or beef tallow, or any refuse grease) as much as will be taken up by the tobacco and soda. For use take two or three gallons of this strong solution and add two hundred gallons of previously prepared hot tobacco solution. The whole is then ready to spray upon the trees, used at a temperature of 130°. This is effectual in destroying the scale, and is good for the tree, leaving it clean and bright. To the strong solution should be added gradually the large amount of tobacco decoction until it has the right life and foamy appearance needed.

The *Red Orange Scale* (*Aspid Aurantii*) remains in Los Angeles County, doing its work with but little change from year to year. It is a most serious pest where it exists.

I have received specimens of the *Aspidiotus Nerii*, a scale infesting the oleander and some other ornamental as well as a few deciduous fruit trees. The bottle in which the specimens are contained contains a very large number of the very minute winged males just hatched out at this date, November seventeenth; also, there may be seen a few young females crawling about. This time of the appearance of the young males in large numbers proves that there are three broods of this scale in the season.

The *Aspidiotus Rapax* is to be found all through the State, particularly the coast counties, but apparently does little harm, although in some places it infests the fruit of the pear to an offensive degree. This scale has been without doubt brought from abroad as a new importation of it was made last Spring upon apples from New Zealand.

The *Aspid Conchiformis* or *Oyster Shell Bark Louse* has kept on its steady way through the apple orchards of the State, and owing to the fact that it usually has caused but slight harm has not been much troubled by the orchardist, although occasionally one is forced to heed its presence. One notable example is that in an orchard at Santa Cruz where the pest appeared in slight numbers in 1881. The next year the scale increased so rapidly that it did very serious harm and nearly killed a considerable number of trees. Some varieties, Bellflowers particularly, suffered more than others. In this case the remedy used was the concentrated lye, one pound to one and one half gallons of water, with good effect. The larger portion of the scale have been destroyed and a good crop of apples secured this year.

The *Aspidiotus Perniciosus* or *San José Scale*.—The work done in destroying this scale has been most gratifying. In my report of last year I gave as fully as possible the information possessed at that time. The condition of the infested orchards has become as a rule most satisfactory, and now again large profits are accruing to those formerly discouraged orchardists who have faithfully combatted the scale. In Santa Clara County, the home of this scale, we may say, the day has been won by the fruit grower, and where three years since orchard land was at a very low figure it has doubled and more than doubled in value, and really fine orchards are hard to purchase at any price. This is the direct result of the success attained fighting this scale on the part of the large number of enterprising horticulturists of this valley. The increase this year in the County of Santa Clara of \$3,500,000 in assessed property is attributable in a large degree to intelligent horticulture, and it is to be hoped that the powers that be will act upon an appreciation of this matter and aid in every way in their power in preserving and fostering this industry. The value of the fruit crop of this county for last year as returned by the Assessor was \$1,611,800, a gain over the previous year's report of more than \$600,000. This includes all kinds of fruits. For the State the fruit crop is the fourth in value, and it was estimated would reach \$10,000,000 this year. It is probable it has exceeded that.

As an illustration of the effectual work done here (and many large and important orchards might be referred to), I will mention but one. This orchard, one of the oldest in Santa Clara Valley, of nearly one hundred acres, has been infested by this scale seriously. It existed in the orchard for three years, commencing in 1880. It was brought in on young trees. It has been fought very vigorously and effectually. The orchard this season practically cleansed of its presence. At

this time, the owner finds the scale upon one young Easter Beurre pear tree. The wash used for cleaning the orchard was: Concentrated lye, one pound to one gallon water, where there was scale, and one pound to three gallons water where not infested. The Bartlett pear yielded to the treatment more readily than others. These required but one washing while the Easter Beurre required five washings. It is now proven positively that birds are the means of carrying this scale from infested orchards to distant ones where clean trees intervene. This, aside from the sure means of introduction by nursery trees, and infested boxes, and clothing, is, I believe, the only way in which the scale is carried about.

The *Perniciosus Scale* has now spread over large portions of the State, both north and south. Wherever it appears, it is urged again, that it be most vigorously treated without delay, else the orchard is destroyed. All young trees sent out for the new planting should be sent clean, and thus be safe to the trusting orchardist. The remedy, now universally used is: Concentrated lye, one pound to one gallon water for *Winter*, and whale oil soap and sulphur mixture, one pound to one gallon water for *Summer*.

The *Icerya Purchasi*.—This scale merits now special attention, and from the serious nature of its ravages, and the difficulty of overcoming it, should receive your most earnest consideration. Last year, in a report upon scale insects, I referred to this insect, describing it and naming many varieties of ornamental trees, shrubs, and plants it attacked. This year I have often spoken of it in my visits through the State, and particularly have I tried to awaken citrus fruit growers to the danger awaiting them where this pest gets thoroughly established. It is there that its greatest mischief is accomplished. While in the northern part of the State the ornamental trees may suffer, the real loss of a living for the orchardist does not occur; but where this once gets a foothold in an orange grove upon which the owner is dependent for an income, he will indeed be fortunate if he succeeds in stamping it out of existence. In all my statements of the ravages of this insect at San José, I have never stated that it attacked the orchards of Santa Clara Valley. I have simply named the apple and pear trees in the cemetery of that locality as showing its presence. I would not have stated that the orchards of this prosperous valley suffer from the attacks of this pest. I most emphatically pronounce the orchards of Santa Clara Valley free from the presence of this *Icerya* scale, and I do but justice when I declare that there is not a *deciduous* orchard in the State that is infested with it, merely saving a few isolated *deciduous* trees in one of the infested orange orchards of Santa Barbara County.

A mistaken impression may have arisen from my remarks about this insect. The development of the pest, as studied for several years now, show that the great work is done upon evergreen and ornamental trees and shrubs. And although where deciduous trees are immediately in contact with the other infested trees they will also become liable to their attacks, yet this insect has not as yet done any damage to an orchard of deciduous fruits in this State. The damage it has done to ornamental trees and shrubs is very great; it has caused a serious loss in that respect, and its spread continues. Without any desire to alarm unnecessarily, or to detract from the good report of any interest, I must, as a matter of plain duty, lift up my voice and warn particularly the growers of *citrus* fruits lest they too late appre-

ciate most bitterly the importance of this matter. I will quote from a high authority, Mr. Ellwood Cooper, who says in a letter to me: "I, however, repeat what I have told you before, and what I have written you, words fail to express the danger of the spread of this pest. The citrus interest does not comprehend the danger in waiting." This is the expression of a careful observer, and one who has most deeply at heart the welfare of horticulture in this State. I have recently returned from a visit to the infested localities, and I can but confirm the statement of the desolating results attending the presence of this insect. I am glad to say that the most vigorous efforts are being made to clear the infested orange orchards of two of the regions affected. The localities where it is found in the north, are San Rafael, San Mateo, and San José. In the south, Santa Barbara, Los Angeles, and San Gabriel. I have been informed by Hon. A. F. Coronel, of our Board, who is in attendance upon the sessions of the Convention, that he has recently found at least three new orchards at Los Angeles infested with this scale. At least they were orchards of which I could obtain no information at the time of my visit. You will learn from Mr. S. P. Stow of his efforts in this direction, using steam as a means of applying remedies.

It was my privilege to meet with fruit growers of San Gabriel and consult with them concerning measures to destroy this enemy already lodged in six of their valuable orange orchards, and from the earnest and decisive proceedings at that time I knew they would soon provide the means to buy, dig up, and utterly destroy the infested trees. This fund has already become sufficient for the purpose, and it is their firm intention to accomplish the work of eradicating this pest. All honor to the example thus set. The same honor must be accorded to the people of Riverside for their successful efforts in preventing the red orange scale from gaining entrance to their fairy land. As has before been mentioned San Diego has taken up the same course in dealing with the codlin moth. Could the whole State show this determination the losses from insect pests would be reduced to a minimum. Last year I gave no statement of the results of treatment, and I will now make to you a report upon experiments made with the *Icerya Purchasi*. I will premise by saying that the difficulties detailed would not be experienced in the case of *deciduous* trees, for our well known remedies for other scale insects would suffice. These experiments have been made and watched for two seasons. You will see mostly failures, and for that reason I wish to state them particularly; but there is also success attained. All experiments were on very badly infested trees and shrubs:

- No. 1. Tobacco, strong decoction, one hundred and thirty degrees.
 December 6, 1882—Applied upon an apple and a pear tree, both small and in a nursery bed where there were ornamental plants.
 December 23, 1882—Examined trees. The scale was not killed. Wash did no injury to trees.
- No. 2. Concentrated lye, one pound; water, two and one half gallons boiled and stirred whale oil, one third gallon, then add considerable sulphur.
 December 6, 1882—Washed one California laurel, one rose, one bridal wreath; used cold.
 December 23, 1882—Examined. It had killed the scale wherever it had come in contact with them. Did not injure the thick-leaved evergreen California laurel, but does destroy the foliage of the bridal wreath and rose.
- No. 3. Whale oil soap and sulphur mixture, one pound to one gallon of water, and used at more than one hundred and thirty degrees.
 December 23, 1882—Washed a large bridal wreath and a large rose.
 January 9, 1883—Examined about one hundred different insects of all sizes and at all stages of development; also, many young that had just hatched out, and still with the eggs adhering

to the mother insects—could find motion in but one insect, which was unharmed. All others were softened and had a putty-like consistence, and were dead—the color somewhat changed, though not very much so. The eggs did not seem to be affected in the sac; bushes and foliage unharmed. (Note—At the time, a little stronger wash will probably be best.)

August 25, 1883—Found on the wreath but seven live scales, and on the rose but four. No old scale to be found; both bushes healthy. New growth of wreath, two feet; of rose, three feet.

No. 4. Whale oil soap, ten pounds; kerosene, one gallon; water, forty gallons.

December 6, 1882—Washed one bridal wreath, one rose, one large acacia tree, taking a section of the trunk.

January 9, 1883—Insects alive and unharmed; foliage not affected in any case.

August 25, 1883—Found that these had all been killed by the insect, and the immense acacia had been cut down.

No. 5. Paris green, one tablespoonful; water, one gallon.

December 6, 1882—Washed a bridal wreath, a rose, and limb of acacia tree.

January 9, 1883—Insects alive—young and old entirely unharmed. Bushes unharmed.

No. 6. Bitter aloes, ten ounces; water, one gallon.

December 6, 1883—Washed a locust and two bridal wreaths.

January 9, 1883—Insects unharmed and still at that time hatching out.

No. 7. Sal soda, one pound; turpentine, one pint; water, ten gallons.

December 6, 1882—Washed rose and wreath.

January 9, 1883—Entirely ineffectual.

No. 8. Lime water, saturated solution.

December 6, 1882—Washed a climbing vine.

January 9, 1883—Insects and vine unharmed.

August 25, 1883—The vine is nearly dead, and a fir tree in the same lot in the cemetery is dying, being covered with the *Iderya*.

No. 9. Pyroligneous acid, four fluid ounces; water, one gallon.

December 6, 1882—Washed one rose and an acacia.

January 9, 1883—Insects unharmed; old and young active and crawling around; foliage not affected.

August 25, 1883—Rose dead; killed by scale.

No. 10. Pyroligneous acid, two ounces; water, one gallon.

December 6, 1882—Washed a *pittisporum tobira* and a rose in bloom.

January 9, 1883—Neither shrub nor insect affected.

August 25, 1883—The *pittisporum* found a mass of scale and dead.

No. 11. Pyroligneous acid (Phil.), one gallon; water, one gallon.

December 23, 1882—Washed a bridal wreath.

January 9, 1883—Not killed.

August 25, 1883—Scale found alive on these shrubs.

No. 12. Pyroligneous acid (Cal.), one gallon; water, one gallon.

December 23, 1882—Washed wreath and rose bushes.

January 9, 1883—Scale not killed; bushes unharmed.

August 25, 1883—Live scale on both the wreath and rose.

No. 13. Pyroligneous acid (Cal.), in varied strength, upon oleander, rose, and wreath, resulted as above.

No. 14. Kerosene butter, 1 pint; water, 1 gallon.

December 23, 1882—Washed bridal wreath and rose bushes.

January 9, 1883—Not killed; neither insect nor shrub appear to be harmed.

No. 15. Spirits turpentine emulsion. The emulsion made of soap bark, and containing thirty-three per cent of turpentine.

December 8, 1882—This strength was applied on dwarf box, saturating the shrub and also the ground at its roots.

December 11, 1882—Does not kill the scale, and does no harm to the shrub.

No. 16. The above emulsion, one pint to one gallon water, applied to small apple tree in nursery bed, and also poured on ground at roots.

December 11, 1882—Found of no effect.

No. 17. Concentrated lye, one pound; water, two and one half gallons; boiled and added whale oil, one third gallon; used cold.

December 8, 1882—Washed *pittisporum tobira* and bridal wreath.

December 11, 1882—Scale all destroyed, and the plants nearly so—too strong.

No. 18. December 8, 1882—The preceding applied to an American elm tree, twenty feet high, over a considerable portion of its surface.

November 17, 1883—This tree has been examined a number of times during the Summer. It has grown well, but has had some scale upon it all the season.

No. 19. Concentrated lye, one pound; water, two and one half gallons; whale oil, one third gallon; sulphur added as much as will be readily taken up; tobacco decoction, very strong, six pints.

December 8, 1882—This wash was applied at 130° to an American elm tree, twelve years old, twenty-five feet high, covering almost the whole of the tree.

November 17, 1883—This tree, examined at various times through the Summer, has shown a vigorous growth and a healthy condition, and has been exceptionally free from the scale. At no time could I find many scale upon it, and careful examination at this date shows not more than a couple of dozen. I should judge this tree is practically clean.

No. 20. Concentrated lye, one pound; water, two and a half gallons; whale oil, one third of a gallon; sulphur, all that can be taken up; tobacco decoction *very strong*, six pints.

December 8, 1882—This, at a temperature of 150° in the kettle, was applied upon an English laurel.

December 10 and 17, 1882, and January 7 and 8, 1883—Examined very carefully and could not find any live scale. They were all destroyed from the day of application, and were quite dried up. The foliage, being of very thick leaves, has not been harmed.

May 26, 1883—My notes show that the tree has made a vigorous growth of new wood. No scale can be found upon it. The old dried up shells of those killed have nearly all fallen off. The same condition has been noted at various dates, and no scale could at any time be found.

November 17, 1883—To-day one small scale, just commencing the growth of the white portion, was found upon the trunk of this laurel; this insect coming from other infested plants near by. This case shows a complete success. The remedy was entirely effectual. This wash is right for so thick a leaf as this evergreen possesses, but is too strong for the thin leaves of the bridal wreath and rose. I would suggest its use as an effectual remedy with a little larger quantity of the tobacco decoction, making the whole five gallons. This wash used hot I regard as the most valuable one of all the list, and with the strength as above given will probably be safe upon thick-leaved evergreens, but should not be used upon those thin and tender leaves spoken of. In the latter case, No. 3 (whale oil soap and sulphur mixture), *hot*, is to be recommended.

No. 21. Whale oil soap and sulphur mixture, one pound to one gallon water, with the addition of kerosene butter, one pint, was applied December 23, 1882, upon rose bushes and bridal wreath, used warm.

January 9, 1883—Scale not killed. In this case the wash was not as hot as in No. 3, although thought to be 130°, but was carried some distance before being applied.

No. 22. Pyrethrum, one ounce to ten gallons water.

November 16, 1882—This was applied by Mr. Milco to ten different trees, shrubs, and plants.

November 25, 1882—The examination showed that the plants were not successfully cleaned of scale.

No. 23. Pyrethrum, one half ounce to one gallon water.

December 23, 1882—Washed rose bush.

January 9, 1883—Found bush still infested.

August 25, 1883—The scale had killed the bush.

No. 24. Pyrethrum, one ounce to one gallon water.

December 23, 1882—Washed bridal wreath.

January 9, 1883—Scale still on bush.

August 25, 1883—Bush nearly dead and covered with scale.

No. 25. Pyrethrum, two ounces to one gallon water.

December 23, 1882—Washed rose bushes and bridal wreath.

January 9, 1883—Insects were not destroyed.

August 25, 1883—Bushes were covered with scale and dead.

These experiments with pyrethrum were made as carefully as possible, but the preparations were not strong enough for this extraordinary pest. It might require the full strength of the fluid extract of the buhach to accomplish the work. While this agent may not be so readily used upon the stubborn scale insects, yet its effects are most wonderful upon certain of the insects which so greatly annoy us. It is invaluable for the destruction of many insects, particularly of the household.

Having in this report brought before you as clearly as I could the condition of the orchards of the State for the year 1883, I have only taken up certain important matters. I greatly desire to dwell upon other and also very important subjects to the orchardist. Time will not allow even an allusion to these themes.

As a summing up of the work accomplished by the fruit growers of the State thus far in the year, it may truly be said that only encouragement is visible to those who are in earnest about the great horticultural work of this favored State.

THIRD ANNUAL CONVENTION
OF THE
FRUIT GROWERS OF THE STATE OF CALIFORNIA.

Under the auspices, and at the call of the State Board of Horticulture, the Third Annual Convention of the Fruit Growers of this State assembled at the rooms of the Chamber of Commerce, in San Francisco, on Tuesday, November 20, 1883. About one hundred prominent fruit growers were present, representing every fruit district of the State.

The Convention was called to order at eleven o'clock A. M., by S. F. Chapin, State Inspector of Fruit Pests.

Professor Dwinelle nominated for temporary Chairman, Professor Hilgard, who declined, and nominated E. J. Wickson. Mr. Wickson was elected.

A. H. Webb was nominated and elected temporary Secretary.

The Chairman, by motion, was instructed to appoint a committee of five on permanent organization, and five on order of business.

The committees were appointed as follows: On Permanent Organization—Messrs. Haines, Johnston, Cooke, Hatch, and De Long.

Order of Business—Messrs. Dwinelle, West, Buck, Coates, and Milco.

The Convention then adjourned until one o'clock.

Afternoon Session.

The minutes of the forenoon session were read, corrected, and then approved.

Mr. N. J. Haines, on behalf of the Committee on Permanent Organization, presented and read the following report:

SAN FRANCISCO, November 20, 1883.

To the President and members of the State Horticultural Convention:

We, the Committee upon Permanent Organization, beg leave to report as follows:

First—That E. J. Wickson act as permanent President, and A. H. Webb as permanent Secretary of this Convention.

Second—That five persons who are members of this Convention be nominated and elected by this body to act as Vice-Presidents of the Convention.

And we further recommend that Rev. A. T. Perkins be elected to act as Assistant Secretary of this Convention.

N. J. HAINES, Chairman.

On motion of A. Block, the report was adopted.

After discussion, the following gentlemen were nominated Vice-Presidents of the Convention, and elected: Hon. William Johnston of Sacramento County, I. A. Wilcox of Santa Clara County, Hon. L. W. Buck of Solano County, W. H. Jessup of Alameda County, Matthew Cooke of Sacramento County, Professor E. W. Hilgard, President of State Horticultural Society.

On motion of A. T. Hatch, the number of Vice-Presidents was increased to six and the report amended to conform thereto.

C. H. Dwinelle presented, on behalf of the Committee on Order of Business, the following report:

REPORT OF COMMITTEE ON ORDER OF BUSINESS.

1. Report on Permanent Organization.
 2. Election of Vice-Presidents.
 3. Election of Assistant Secretary.
 4. Address by the President of the Convention.
 5. Address by Hon. Horace Davis, President of the Chamber of Commerce of San Francisco.
 6. Paper by Dr. Kimball, "To Orchardists."
 7. Paper by Mr. James Shinn, on "Apple Culture."
 8. Report of Committee on Fruit Statistics and Ways and Means.
 9. Paper by Mr. Cutter, of Riverside, on "Raisin Culture."
 10. 7:30 p. m.—Paper by Dr. H. W. Harkness, "Fungoid Diseases of Fruit Trees," illustrated by specimens.
 11. Wednesday, 21st, 9 a. m.—Paper by A. P. Crane, on "Canker Worm."
 12. 10 a. m.—Paper by L. W. Buck, on "Peach Culture."
 13. 11 a. m.—Paper by C. H. Dwinelle, "The Need of a Knowledge on Insects."
 14. 11:30 a. m.—Paper by Felix Gillet, on "Codlin Moth."
 15. 1 p. m.—Report of Dr. Chapin, State Inspector of Fruit Pests.
- Other important papers and subjects for discussion will be presented before the close of the Convention.

C. H. DWINELLE, Chairman.

After a discussion on the foregoing report, on motion of Dr. Chapin, it was decided that the report of Committee on Fruit Statistics and Ways and Means, being No. 8 on the programme, should exchange places with the paper of Dr. Kimball, "To Orchardists," being No. 6. After which correction the report was adopted.

THE PRESIDENT: Gentlemen of the Convention, we meet in this room at the invitation of the Chamber of Commerce of San Francisco, an organization composed of our leading merchants, and they, recognizing the community of interests existing between the mercantile and producing interests of the State, have kindly tendered to us the use of their hall and everything pertaining thereto. It has been thought that it would be eminently appropriate that we should have some expression of good will and sympathy from that organization, at whose invitation we meet here to-day. I therefore shall take the liberty of calling on the Hon. Horace Davis, President of the Chamber of Commerce, to address you.

MR. DAVIS: Mr. Chairman, and gentlemen of the Convention: When the Secretary, or committee of your body, asked me to address you, I declined the invitation, for I felt that there was nothing that I could say on the subjects that are close akin to you that would be of any benefit to you, and I did not care to fire blank cartridges at you, and, therefore, I thought that I had better hold my peace; but, when afterwards I met Mr. Wickson, your President, and he said to me that you wanted from me simply an expression of sympathy between our body and yours, simply an address of welcome, simply

an address touching on those points where our interests and yours are in common, I accepted that invitation with great pleasure.

Gentlemen, as the presiding officer of the leading commercial institution of this city and this State, I welcome you here to-day.

We feel that our interests and your interests are, in a large measure, identical. We represent not simply the merchants. Our body is composed of a far wider sweep in the community than the merchants alone. We include the merchants, the bankers, and the manufacturers. We represent the business community of this city, and we have men, more or less, from the interior. We include the merchant and importer, who receives goods from foreign countries, that are brought here to be distributed through the whole length and breadth of the State. We include the merchants here who distribute those goods after they reach here. We include the ship owners who carry away your products when they are brought here to be marketed. We include the bankers who furnish you as well as us with what are the sinews of commerce as well as the sinews of war; and we include the manufacturer, not only men who, like myself, receive your produce and the produce of other agriculturists and other interests of the State, and work them over fit for human use, but also those men who work up the foreign products that are brought here, and who make the thousand and one things you require both for your agricultural and your domestic needs; your agricultural implements, your horticultural implements, and all domestic articles of the house, clothing, furniture, and for things of use and ornament that are made here for your consumption.

Now, nothing can affect you that does not affect us; the drought that starves the wheat harvest, the norther that blasts the fruit crop, are felt all along down the line. It is so many less ships for the importer to receive; it is so many less goods for the merchant to distribute in the interior; it is so much less for the banker to loan; it is so much the less material for our manufacturers to work up; and every farmer, having his income so much diminished, must practice economy to balance it, and so the sales of the distributing merchant are limited and diminished. The farmer has the less to sell to pay his bills, and he must economize accordingly. He economizes in his clothing, in his furniture, in his luxuries, in his pleasures. Every merchant up and down the street feels it, and in turn less goods are sold and less buildings are erected, and it comes on finally till it touches the laboring man, and so the whole community of our city and State is affected, directly almost, by your good fortune or by your disasters. Now, gentlemen, it is clear to you that we must feel a great sympathy with institutions like yours, that tend to develop the producing interests of the State; that the producers of the State and the commercial interests of the State are so closely linked together that they really form but one community.

But before I close, if you will allow me to speak to you for a moment as an individual, I want to express all the interests that I feel as an individual in the fruit-growing industry of the State. I have felt for many years that the future of this State depends mainly upon the success of those industries that you are advocating—that you are taking care of in this Convention. I think that the development of the resources, the increase of riches, the increase of population in this State from now on will depend mainly upon the success of this body of men in extending the fruit-growing industry, and in

coping with the difficulties which you have to contend with now. I do not say that by way of compliment, but it has been my honest and sincere conviction for many years. It is plain to me for these reasons: In the first place, your crop is surer than the crop of grain; in the next place, you can produce a great deal more to the acre; in the third place, you increase the value of the land, where the grain raiser only exhausts it; and in the fourth place, because you require so much more of care, of industry, of patience, and of prudence in your business, that you must inevitably raise a better class of citizens; and, moreover, the fact that your industry requires so much individual attention, lessens the quantity of land you are capable of holding and cultivating, and so tends to the cutting up of that portion of the State which is fit for your purposes into smaller holdings, which is the salvation, the prosperity, and the safety of the State. [Applause.]

There is no necessary contest between wheat growing and fruit growing, there is room enough for all; room enough for you and for the grain raiser, and here let me say one word: Grain raising is always the leading industry of a new community, or else of an ignorant people. This is in my line of business, and, perhaps, I ought not to talk sharp here; but I wish to tell you how this thing strikes me. England receives her surplus to-day from the new sections of the United States, from her colonies in Australia and Canada, from Chili, from India, and from Russia. India and Russia, I need not tell you, raise grain because too ignorant to raise anything else. The new sections of the United States raise grain because the people are too poor. They have not enough accumulated capital to raise anything else. Wheat is the first resource of the man who goes on to and breaks up a new piece of land, and he raises wheat until he can turn his attention to something better, to something that will produce more money to the acre, and then he drops his wheat. As you start from the Atlantic States and go west, many of you will remember how Genesee flour was the food of your early days, and the chief product of that section of New York. To-day you get nearly to the Mississippi River before you find a State that produces a surplus of wheat, and the same process is at work in this State, and from those sections from which I first derived the wheat necessary for my business I get nothing to-day. The coast counties have gone into dairying, the interior counties into fruit growing, and they are big, rich, and prosperous communities. Now there is room enough, I suppose, in this State, for all of us.

Maybe the plains will always be devoted to wheat, but even if they are, there is almost an endless expanse of land in the rolling country, and in the red foothills, which is fit for your purposes to a degree that is almost unequalled by any land on the face of the globe, and I believe that I shall live—nay more, I believe that in ten years from to-day the fruit crop of this State, together with the manufactured products that come from it, will far overtop in value the grain crop of the entire State of California. I believe it. I mean surpass it in dollars and cents in value, and infinitely surpass it in value of the crop per acre, to the people who raise it. And you have so wide a market. That is, with your consideration, your fruit produced, these dried fruits, these canned fruits, these fresh fruits, and the wines, and the grapes, and olives. You can send them all over the globe. You find a market everywhere, but if you harvest your wheat, there is but

one place to send it to, and if they are able to raise all over their price, you must raise or lower your price accordingly. But, above all, it saves you from the thralldom of the skipper. You are no longer dependent on shipping. The value of your profit is so much greater than the value of transportation that you are, to a certain extent, the masters of your own market.

So, gentlemen, I congratulate you upon the prosperity of your interests, and I am glad to recognize the community and sympathy existing between your institution and ours, and I close, as I began by bidding you God speed in your Convention. [Applause.]

THE PRESIDENT: Gentlemen of the Convention, you have, unfortunately for yourselves, chosen a President who cannot make a speech, although he thoroughly appreciates the hearty address or welcome which has just been tendered us; but I know who can speak, which is always the next best thing to being able to do it yourself, and so I call upon our distinguished Vice-President—Senator Johnston, whom we had so much trouble to elect—to respond to the remarks of the Hon. Horace Davis.

SENATOR JOHNSTON: Mr. Chairman, and gentlemen of the Convention: As you all know, speech-making is not the forte of a tiller of the soil, yet whenever I am called upon to do anything by a community of people, or a body of men, I shake the responsibility by putting it upon them. I am not responsible for being here. You have called upon me to respond to this very elegant address, which I am now endeavoring in my feeble way to do. To begin with, I desire, Honorable Mr. Davis, to thank you, and through you, your associates of the Chamber of Commerce, for the very high compliment you have paid the fruit growers of this State by tendering them the use of your magnificent hall for their use during the meetings of this Convention. I am also going to thank you for the unanimity and community of friendly feeling which you express as existing between those whom you represent in your organized capacity, and we who are together here for the purpose of discussing matters pertaining to our life work. That there is a unity of feeling and a community of interests, no man of ordinary intelligence will for a moment deny, and we perhaps are the center of that, to this extent that through our prosperity you prosper, and through our adversities or disasters, you are injured.

The magnitude of the interests which we represent, to wit, the fruit growing of California, is a subject which, perhaps, no single individual can properly appreciate; because there is no man, perhaps, who is thoroughly versed in, or acquainted with all the different interests throughout this State, for be it known to you, sir, that we have a whole empire here, in territory, climate, and soil, and all we lack to make it a great empire is population. That population, as you have stated, depends largely upon the fruit interests of this State, from the fact that it causes a large tract of land to be cut up into small farms and occupied by the actual tiller of the soil. Fruit culture necessitates small farms. Whilst one man can cultivate thousands and thousands of acres of wheat, it is impracticable, as we see it from our standpoint, for a single individual to control a large number of acres in fruit as compared to what he can control in wheat culture or in stock raising. Therefore, our interests are a great benefit to the State in that respect, in dividing up large tracts of land to be cut up into small farms, and occupied as I have said, by the actual

tillers of the soil, for the prosperity, not only of themselves and their families, and their surroundings, but of the whole State.

Your estimate, sir, of the future magnitude of the fruit production perhaps will be realized. We hope it will. We hope to live to see the day when we will vie with France in our fine wines, and with all the other countries in our fine dried and canned fruits. I think perhaps the canned fruits of California have a standing now all over the world which no other State in the Union can equal. I think there is no community, at least no single State, which has advanced so far in the single article of canned goods as the State of California. Then our dried fruits. We have the world for a market. There is no end to the market so far. We of California are in the habit of overdoing everything we undertake to do. We may overdo the fruit business. We have not done it yet. Our market is better now than it was ten years ago. We have a great many things to contend with in our business which brings us here to-day.

Mr. Davis rather apologized for talking shop to us. I do not think the apology was necessary, for that is what we came here for. We came here to talk about our business and to confer together, and to educate each other in our business, and we believe it to be to our interest to do so. We think that by coming together here and exchanging ideas that we can improve ourselves—we can educate ourselves, and by educating ourselves we can improve our business, and by improving our business we can improve our exchequer, which is the substance of all things that we are striving for. That is the principal thing that brings us together. If there were not some selfish motives in this I do not think we would be here. I know I would not be here. I came here for the purpose of learning something and for the purpose of being benefited. I believe every man has that motive in view, and if I did not think that I could learn something by coming to this Convention, and by listening to the deliberations of this Convention, I would be attending to my fields and sowing my wheat. But I thought it more profitable, and I still think so, and the word that the President pronounced upon us, "welcome," has a great significance to me. If we have *well come* here our object will be achieved, but if we have not come here for the purpose of doing good unto ourselves or to somebody else, we had better have attended to our business and stayed at home. But I take it that every man came here for the purpose of doing good, not only to himself, but to his neighbors. That is one of the cardinal principles of the order of the Patrons of Husbandry to disseminate knowledge. It is the duty of every one to impart all the knowledge that he has to his neighbors, and if he does not do so he is not a true Patron of Husbandry.

And now, Mr. Chairman, we have more important business to attend to, sir, than to resolve ourselves into a mutual admiration society, and as complimentary speeches are not in my line, I will close to give you an opportunity to engage in a more profitable business. [Applause.]

THE PRESIDENT: We meet here to-day at the invitation of the State Horticultural Society, extended to us last year, and we would like to have from them a word of welcome and good will, so I will call upon the President of that Society, Professor Hilgard.

PROFESSOR HILGARD: Mr. President, my ability to speak is a good

deal less than that which the modesty of the last speaker caused him to give himself. I will say briefly that on behalf of the State Horticultural Society, I bid you most heartily welcome to this city and I am pleased to see at this early hour in the session of our Convention such a large attendance of representative men as is now before me. But a few years ago it would have been simply impossible to arouse sufficient interest to bring together a party like this. In a very short time, comparatively speaking, we have learned that communication of our knowledge with each other is the best mode of benefiting our mutual interests, and I must say that we owe this in a large measure, to that which in many cases has produced a similar effect—to a little trouble, to a little harassing.

I think that the noxious insects, the bugs, as they are popularly known, have a great deal to do with this interest awakened in our pursuit. But for them I think we might still be working each one for himself, with very little communication with one another of the useful experiments, plans, and thoughts of each. This communication amongst ourselves is of the very greatest importance. In each district, and I might say in each neighborhood, separate local experiences have been made, and it is extremely important, in the varied climes of California, that we should know what is the most profitable and what is best adapted to each particular locality. We hear of San Francisco and the bay counties having a week of fog, and I understand that the most beautiful bright skies at the same time prevailed in the interior. How can we then, in Alameda County, prescribe what is best for you in Napa, in Sonoma, or in the great valley? We must exchange our views, and it must be distinctly understood that what is true for one locality may not be true for another. I remember that a few years ago articles were published on fruit growing, and our local experiences were put forth as being general truths, and that led to contradiction and strife, and in some cases a great deal of uncharitableness. At the present time there are some communities in which it is not safe to suggest that what they happen to be doing is wrong; that the crops, or the fruits they have planted, are not well adapted to that climate. I am afraid that we shall have some dear experience in that direction before we get thoroughly settled as to the local adaptation of soil and climate. It is by these meetings that these matters can be brought out. And this Convention, as started three years ago, has shown the progress of sentiment in this regard most brilliantly. I recollect when the State Horticultural Society was first begun we could scarcely muster a corporal's guard, and now, although the immense extent of the State forbids the attendance of a great many members, we generally have large and interesting meetings, and if we have not the presence, we have at least the sympathy of many outlying members, and I may say, on behalf of the Society over which I have the honor to preside, that our labors are appreciated, and printed not only in this State, but even outside of it, as far as Europe.

I think I may add to the recommendations for fruit growing in California, mentioned by the Honorable Mr. Davis, one to which he has not alluded. I refer to the monopoly which we have of certain fruits in California. We have an advantage, for instance, in the raisin industry. It is true that we are not a viticultural convention, but grapes are fruit, and as such, we have a right to say something

about them. We have the monopoly of the European grape. In the east they can grow the American grape, but it is unfit for raisin making, and it makes only a kind of wine at which the French, and a good many Germans in the old country, turn up their noses. They say it is foxy. Now, that industry, I think, is eminently safe.

I don't think that any country on the American continent will ever compete with California for grape growing and wine making. In the raisin and wine industry, I do not think you will have any American competitors. In other fruits we have. There are certain other localities in the United States where they can produce fruits as well as in California. New Jersey, for instance, can produce a large amount of peaches, but it is very small as compared with California, and would cover only a small portion of our foothills. And I emphatically assent to the proposition made by Mr. Davis, that a community of fruit growers must be exceptionally intelligent; a community of wheat growers may have large tracts cultivated, and a sparse population, but it consists of rich men and poor laborers, whilst a fruit growing section must be exceptionally intelligent, necessarily—I think intelligent and educated. I think this industry conduces eminently to education, and to small holdings, which necessarily brings about a degree of popular intelligence and education which it would be difficult to equal anywhere else, and from that point of view then, I consider that this Convention has great hope before it, and that the adaptation of fruits to the various climates and soils of our State is among the great points which we will have to consider very seriously, and we need all the light that we can get, and which I hope we shall get largely from the deliberations of this Convention. It all will be eminently welcome. The past meetings have already shown what can be done, and I hope that the large attendance which I now see will be very materially increased in future days; and now, once more, gentlemen, I bid you most heartily welcome to the city. [Applause.]

THE PRESIDENT: I will take the liberty of returning the sincere thanks of the Convention to the State Horticultural Society and its representative, for the welcome extended to us, and the important statements made in the address to which we have just listened.

The report of the Committee on Fruit Statistics and Ways and Means was here presented and read by Mr. A. T. Hatch, the Chairman of that committee, after a few preliminary remarks in presenting the report.

REPORT OF COMMITTEE ON FRUIT STATISTICS AND WAYS AND MEANS.

Your Committee on Ways and Means and Fruit Statistics, appointed at our last annual Convention, respectfully report, that whereas no system at present exists whereby fruit growers can receive reliable information relative to the prospects and estimates of each season's crop in California, and being thereby often influenced from the reported abundant crops, are induced to sell at prices below the actual value of their fruits, and in view of the necessity of such information, your committee would recommend the appointment, by this Convention, of an Executive Committee, consisting of at least one member from each fruit district in the State, with power to add to their number at their discretion, with full power to formulate and carry out a plan by which such important information may be disseminated to those fruit growers who subscribe to and support such plan.

Your committee would further recommend that said Executive Committee have full power, and that it be their duty to secure accurate information of the condition of the fruit crop of this State, and so far as practicable, of the Eastern States and abroad; and at frequent intervals, through a Secretary to be employed by them, transmit such information at such times and in such manner as they may determine.

Subscribers only to be entitled to the privileges and benefits. All telegraphic information from the Secretary to be paid for by the person receiving it.

The said Executive Committee to have the power to make such rules and regulations for their government as they may deem necessary to give full force and effect to the above provisions.

A. T. HATCH,
A. BLOCK,
S. F. CHAPIN,
F. C. DeLONG.

MR. HATCH: It does not seem necessary for me to give any reasons why such a report should be adopted. You probably have all felt the need of it during the past season. We know that the fruit buyers to a great extent do have means of determining in a great measure the condition of our crops and can estimate approximately what the supply and demand will be, whereas fruit growers to a great extent are devoid of any information of that kind. They know before we do what our fruits are worth, and come to see us and offer us prices which look to us such as we can sell at good profit, which is well enough, but if our fruits are worth more we are willing to have that, too, and we are entitled to it, providing the supply and demand justifies it.

MR. BLOCK: I desire to say a few words to show you, if possible, the necessity of this measure. Most of you will remember two years ago, when the organization of canners in the City of San Francisco made their arrangement, that they would have but one purchaser of fruits. Our fruit was not yet in bloom when you were informed through the papers that California would raise the largest crop of fruit ever raised in this State. You cannot tell how the rain or the frost will affect your crop, and sure enough, the frost affected it and we did not have a large crop. One man in the City of San Francisco fixed the price of our fruit, what we would get for the canned fruits we were selling. We were in utter ignorance. We had no means of information, no system of interchanging information between us. We did not know how much fruit could be raised nor how much would be required, but I know that the prices of our fruit were considerably reduced by such a report. These reports were not true. I do not advocate the circulation of any but true reports, but whatever the prospects of the fruit crops are, let us also know it. We know that the canners send parties out to ascertain what the fruit crop will be, not only in this State, but in the Eastern States. We know that eastern shippers are informed of it, and why should we act in ignorance; why should we not have a system by which we can act intelligently. In the month of June, of this year, we were informed that the eastern crop of fruit was destroyed. The statistics, for instance, of peaches, showed 5,500,000 baskets. That is certainly inadequate to the demand, yet there was not one out of a hundred of us that knew it at the time. Later in the season it was still further reduced, affected by the drought, so that of that crop there was not one half that was good. The same was true in regard to apples. The apple crop failed in the Eastern States and the apple crop failed in Oregon. Did we know anything about it? We were all groping in the dark, and yet with a very little effort and some small expense we could have had this information, which would have been of great benefit to us. Now it may appear that we are not much interested, but I say we are. This year, in the month of June, we had two hot days, which affected the currant crop and other berries. The plums and apples were to some extent scorched. Now I have no currants and it might appear that

I am not interested in them. I know that apples are a substitute for currants and for other berries. They make the body of the jellies for currants and other fruits out of apples. We that had apples were interested in it, and it was of interest to us to be informed of that fact. Suppose we have a frost in one section of the State and none in the other, I think it would be well for us to be informed of it, and it is now proposed to create a system by which we can have that information. Of course it is expected that people should pay for it, and I believe that for \$1,000 a system could be created to disseminate reliable information.

A. T. HATCH: Mr. President—In our former Conventions we have limited the time of speakers to five minutes each, unless permission were given to extend it. I would move that that should be the time allowed to each one.

Motion seconded, and carried.

On motion of SENATOR JOHNSTON, Mr. Hatch's motion was amended that each member should be permitted to talk but once on each subject.

The amendment was accepted, and the motion as amended was adopted.

On motion, the report of the Committee on Ways and Means was adopted, after discussion.

MR. CHAPIN: As this is a matter of such great importance to the fruit growers of the State, I would suggest that to-morrow evening be appointed as a time for further discussion of the report, and that an Executive Committee should be appointed which, meanwhile, should thoroughly canvass and discuss the subject and present their report to the Convention, which could then thoroughly and fully consider the report and take intelligent action upon the same, and they could also give the necessary information to the Convention on Thursday morning, so that if any changes should be proposed, or discussed, there would be ample time for the Convention, before it adjourned, to have fully considered the subject.

MR. HATCH: All that is necessary for the committee to decide is whether such action as is outlined there is proper, and then they can select from the fruit growers of the State one or more to whom they can trust this matter of formulating it, or making it run smoothly, and the sooner we take action upon it the better.

MR. CHAPIN: I would move that the matter be taken up this evening, at the close of Dr. Harkness' lecture, by the committee who shall be appointed.

Motion seconded and adopted.

MR. PRYAL: I think it would be well for the subject to be discussed at an informal meeting this afternoon, so that you can hear the opinions of the various fruit growers upon the subject.

MR. HATCH: I would make a motion that the Chair appoint a committee of five who would receive such suggestions as were made, and then recommend names back to the Chair for appointment.

The following nominations were then made for members of the committee: Benjamin Bates of Sacramento County, F. C. De Long of Marin, Joseph Sexton of Santa Barbara; W. H. Aiken of Santa Cruz, C. H. Dwinelle of Alameda, W. N. Gladden of Sonoma, Leonard Coates of Napa, A. T. Hatch of Solano, Hon. A. F. Coronel of Los Angeles, Samuel McKinley of Los Angeles, James W. Violet of Amador, Hon. L. W. Buck of Vacaville, Dr. Strenzel of Contra Costa,

Nathaniel Jones of Contra Costa, M. Denicke of Fresno, Gustave Eisen of Fresno, W. B. West of San Joaquin, H. J. Llewellyn of Napa, A. Cadwell of Sonoma, G. M. Gray of Chico, J. M. Goodwin of Tuolumne, Dr. Dale of Merced, J. M. Hixson of San Francisco, G. P. Rixford of San Francisco, James Shinn of Alameda, Felix Gillet of Nevada, G. W. Fraser of Solano.

On motion of SENATOR JOHNSTON it was resolved that Dr. Chapin be considered an ex officio member of all the important committees appointed by this Convention.

MR. HAINES suggested that the Committee on Order of Business should designate some special time for the discussion of the labor question.

COLONEL WEBB here read his report as the Secretary of the State Board of Horticulture.

[This report can be found on page 9.]

The report of the Secretary was adopted and placed on file.

MR. COOKE here gave notice that he would reply to the report at some future time.

MR. PRYAL: I make the suggestion that in this connection the question of new fruits be brought up.

On motion of MR. PRYAL, this was referred to the Committee on Order of Business, requesting them to fix a time for the discussion of the same.

JAMES SHINN here read a very interesting paper on the subject of apples and apple culture, after which he said that raising apples was still remunerative, as they command a price of two dollars a box, and many of them only forty-five pounds in the box. With reference to the codlin moth he said that there was no use to attempt to get rid of it if currant bushes were raised between the apple trees.

THE APPLE.

[By JAMES SHINN, Niles.]

The apple is probably the most valuable of all our fruits. If we would make a true estimate of the relative value of the apple in the long catalogue of fruits, we must take into account several important facts and circumstances. The fact that this noble fruit can be grown, and is grown, in almost every part of the temperate zone, adds greatly to its general value; and when it is added that wherever it is grown, and especially in all northern regions, it can readily be kept for use the entire year—and if we call to mind the many ways in which the apple may be used so as to contribute to the comfort and even to the support of the human family—we shall probably concede to the apple a place at the head of the list of fruits of temperate climes.

The apple is indigenous to all parts of Europe and America. The wild or crab apple is native to almost the entire temperate zone, and though we may not be able to trace the various stages of improvement by which the wild apple has been brought up to its present high attainment, yet there is no reason to doubt that all our known varieties are the progeny of the wild crab.

In this State, the apple has occupied a very important position among the various fruits that have been grown.

Among the early importations of fruit trees from the east, the apple tree was always prominent. Many of the trees first brought to this.

State consisted of varieties not suited to our climate, and these trees have produced much of the inferior fruit with which our markets have been overburdened. Some varieties, however, even of the earliest importations have proved eminently adapted to our needs, and from these our growers have been enabled to produce apples that have been the admiration of all who have seen them, both at home and abroad. Thus it has been fully demonstrated that the soil and climate of this State are well adapted to the culture of the apple. Good apples may be grown in every county in California, and first quality of apples have always commanded paying prices; and prices have steadily advanced until now it may truly be said that good apples bear a higher proportionate price than any other class of fruit.

But is there not another and a dark side to the picture? Are there obstacles in the way of the production of good apples? These are important questions, and, unhappily, can only be answered in the affirmative. There are grave and formidable difficulties in the way of growers of this fruit in this State, and in every part of it. It is true, as stated above, that our soils and our climate are all that can be desired—the demand for good apples is sure to be very large in all the future, and at good prices; but of what avail is this if our apple trees, in leaf and branch, are to be destroyed, or rendered short-lived by armies of insect pests—caterpillars, canker worms, woolly aphis, scale, and others too numerous to mention? And what encouragement has the orchardist to extend the apple culture if the fruit itself is smitten and rendered worthless by the codlin moth?

I do not propose to enter upon any particular description of the insect destroyers, nor of the remedies proper to be employed in destroying them. I rejoice to know that we have a "State Board of Horticulture," which has been organized with special reference to the great work of devising means for the extirpation of fruit and tree pests of all sorts, and of diffusing among fruit growers such information and instruction as may enable each owner of fruit trees to act understandingly in his efforts to destroy these destroyers. Before this Convention concludes its labors, this whole subject will no doubt receive all the attention its importance demands, not only from the officers of the State Board, but from other competent gentlemen who have had experience in the matter. I will add that unless there is a vigorous and united effort made on the part of all who are interested in the production of fruit to prevent the further spread of these pests, and to exterminate them, the growth of apples and pears in this State may as well be abandoned—at least all hope of profits from their culture may be given up.

I believe it is now conceded by all who have made the subject a study, and by all who have faithfully labored in the destruction of all those insects which prey upon the foliage and the branches of trees, that these, in all their variety, may be destroyed by proper efforts, and our orchards kept clear of them. This leaves us only that arch-enemy, the codlin moth, to be dealt with. This great enemy who makes his principal attacks in the dark, has thus far baffled all efforts to completely dislodge him. Whoever can lead us to a complete victory over this great destroyer will be accounted a real benefactor.

I have said that good apples may be grown in every county in our State. Still it is true that some soils and some localities are better adapted to this culture than others. Apples grown upon the higher

portions of the State are, in several respects, superior to those grown on the lower valleys. They may be kept longer—and this is a material advantage. Any soil that will produce good wheat will almost infallibly prove good for the apple. The best soils are probably the strong calcareous loams.

In our climate an apple orchard should be kept clean and mellow. The trees should not be overcrowded, but should have plenty of room, and no other crop should be grown thereon. The practice of growing currant bushes, or corn, or, indeed, any other plants in an apple orchard, is to be condemned, after the trees come into bearing. The apple trees will need and eventually will appropriate all the latent strength which is in the soil, and the production of other fruits upon the same land will sooner or later detract from the capacity to produce good apples. Another grave objection to the planting of other trees or shrubs between the rows of apple trees is, that these plants afford protection to the worm that produces the codlin moth. What finer shelter could these worms ask than that afforded by the many branched currant bush, or the stalks of corn with their many nice hiding places.

Apple trees, especially in our warmer valleys, should be trained with low heads, so pruned for several years after planting as to secure open and spreading heads. This method of training low will of course involve some additional trouble and expense in the cultivation, but this will be far more than compensated by the probable freedom from borers, and by the greater facility of gathering the fruit.

The question of what varieties are most suitable and profitable to be grown is an exceedingly important one. Much of the success of apple culture will depend upon the varieties grown. The importance of growing only the best will be apparent to any one who will carefully study our city markets and the supplies of apples that are sent to it from various portions of the State. Some varieties are hardly worth the trouble and expense of sending to market, while others command good and even high prices. But a list of varieties that would be just suited to one locality might not be exactly adapted to another. Differences in soil, and especially the wide differences in elevation, make it impossible to prescribe exactly the same list for all. For example, the Baldwin and the Spitzenberg, both very superior fruits, are yet hardly to be commended for the coast counties, but are both highly valued and fully successful in the northern counties, and so of others that might be named. The planter of apples must therefore have regard to these circumstances in selecting his trees, and must plant such varieties as are known to be adapted to his own locality. If this rule were generally observed by apple growers our markets would soon be supplied with all desirable sorts, each in its season, each locality furnishing those best suited to it.

Still, some general principles or rules may be suggested for the selection of varieties of fruits, not only apples but all other fruit trees. None but the very best should ever be planted, and these should be chosen with special reference to locality, and to the market intended to be supplied.

One point cannot be too strongly insisted upon, and that is, that the planter shall resolutely limit the number of varieties which he plants. The principal reason why we see so much inferior fruit in all our markets is, that little care was taken in the selection of sorts when our orchards were planted. Whatever excuses the early plant-

ers may have had for this negligence can no longer be pleaded. We can now select such as we know to be good and salable. I repeat that none but the best should be planted, and always such as are known to succeed where planted. It would hardly be safe for the apple grower to ignore the well known fact that most consumers of the apple prefer large and high colored fruit, and will pay higher prices for them than for smaller and yellow fruit. To this last, however, there are some notable exceptions. The Bellefleur and yellow Newtown pippin, and perhaps a few others, are general favorites, and always command full prices.

Whether purchasers will ever learn that color, or even size, do not determine the quality of fruit, is a problem which the future only can solve.

MR. HATCH: I do not pretend to be an apple grower, but the remarks of Mr. Shinn impressed me in regard to the growing of shrubs, or vegetables, or currants amongst apple trees. I would like to ask, at any time, even at the time of first planting, if it is really profitable to plant anything among apple trees or any other trees in an orchard. Whether the profit derived from raising vegetables, or shrubs, or currants may not be less than the damage done directly or indirectly to the trees, by drawing from the soil nourishment which might not be necessary for them during the first years of growth, and the absorption of that food which at a later date it might be necessary to return. I ask whether it would be best to raise something for profit now, and return it at a later date, or let it lie latent in the soil. It seems to me in a great many instances it would be better not to plant intermediate shrubs or vegetables. So far, fruit growers in California have not added to the fruit supply in the ground, but have robbed it by every possible means, planting vegetables, shrubs, and corn between the trees.

MR. BLOCK: I would like to hear from Mr. Shinn, or any other member, as to the character of the soil he considers most beneficial for apples, and I would also ask what fertilizer he considered best adapted for soil that had been worn out. I would like to hear from Professor Hilgard on that matter.

PROFESSOR HILGARD: Mr. President—As regards the planting of shrubs and vegetables between rows of trees, it is in a great measure a question with the producer whether or not he can afford to let the land between his trees lie idle during the three or four years required in California to bring trees into bearing. It can be afforded in California, if anywhere. That it is an injury to the orchard itself there can be no question; and when the crop is taken away it is very injurious. I have made inquiries and this has been the reply, that those growers who can afford to wait may do without, but the poor men, who cannot afford to wait, must plant other crops in between until the orchards come in bearing. But the misfortune is, that they continue it afterwards. I think that they should recollect that for every shrub planted they have to bring in manure afterwards, and it is purely a financial question whether they can better afford to let the nutriment lie in the soil, or bring in manure afterwards. The question of fertilizers is very comprehensive and depends upon the soil.

Now, in regard to Mr. Shinn's remark as to the region of the apple. Undoubtedly the cultivated apple is a descendant of the crab, and

when we go to the wild crab and see what soils it naturally grows on, and naturally prefers and occupies, in fact to the exclusion of other soils, we find that it is almost everywhere a black calcareous soil; such a soil as we would call in this country black adobe, and I say this publicly in answer to a great many questions that are sent to me. I say you can plant apples on crab stock. I don't believe that the best flavored fruits will grow on that soil, but it is certainly a fruit that can be grown successfully on soil which the crab naturally selects. In the Southern States and in Siberia the wild crab takes to black calcareous soil, and, therefore, as regards the fertilizers to be used, if the soil is not naturally calcareous, one of the first things to be done is to add lime. I think that when gentlemen find their apple trees giving out that is unquestionably one of the first things to be done, unless the soil is naturally very rich in lime; but the soil is such an exceedingly complex body that it is impossible to give general rules in regard to it. The giving out of the crop may be due in one case to the exhaustion of one ingredient, in another case, the exhaustion of another. Now, in California, lime is very abundant in the soil, and if any apple orchard is giving out, I doubt whether lime would be called for. Some time ago I received an inquiry from a gentleman as to what he should use for his strawberries. I inquired about his soil, and found it was very poor in potash, and I recommended him to use commercial potash. He has done so, and he has found it very profitable, but it was in that particular soil, and I cannot say whether five miles off, if the phosphates might not be the thing. We can hardly give a general reply to the question. I find that very few California soils are poor in lime. There is, in fact, only one region that I know of that is originally very poor in lime. It is a streak of red foothill soil which runs along from Shasta County, I don't know how far south, but I have not been able to determine, though I would like to know. Nearly everywhere else lime is abundant, and I should not recommend it as a fertilizer for that reason. In a good many cases I have no doubt that phosphates are required. In the majority of cases I think phosphates would be most particularly called for, because, I am sorry to say, it is generally deficient; that is, not generally abundant in California soils, as compared with the soil of Oregon. And I find California soils so much deficient in phosphates that I would say that commercial phosphates should generally be thought of first, unless something should be known to the contrary.

MR. AIKEN: I am much pleased with Mr. Shinn's able paper. I am a believer in the apple. I have about three thousand trees, but I grow them on rich soil and see to it that my soil and my apples are not starved out. I have been in the habit for some years of having the Winter's growth of clover or grass, or whatever you might call it, plowed under in the Spring. It makes a first-rate manure. I cannot say that it is necessary to do this every Spring, but I would suggest that where people have rich soils that naturally grow to grass or clover in the Winter time, that they should allow them to grow, and in the Spring time, when convenient, plow them under as a manure. I know I treated something like a hundred acres that way last Spring very successfully, while one of my neighbors was working all Winter in keeping the grass from growing, and he has succeeded for many years, but his apples are not as large or as numerous as my own. I believe in rich soils, and not only rich soils, but in keeping them rich, and I believe in not planting anything between

the rows. We are planning a great deal for the future, and I believe in reserving the natural strength and material in the soil that makes and matures a good apple, and in not taking it away in crops that we may plant between the trees. I believe that the policy is a very short-sighted one.

In Santa Cruz County we raise what I call a very good apple. We have a rich soil, we have a great deal of rainfall, and we cultivate the land well; then, another thing, we have a great deal of sunshine, but not the excessive heat of the valleys. The apple requires a long season to mature. In hot valleys, where the maturing of the apple is forced by the heat, it becomes mealy, and it loses that acid and that snap of our Eastern apples, but where the season is cool and long, as in Santa Cruz and in many coast counties, the apple matures late in the Fall. It grows large and has a great deal of sap, and is not burned or overheated. I have sold apples as late as March or April; that is, the Newtown pippin, ripe and full of juice. Of course such apples command not less than two dollars a box in this market, and apples are now generally commanding about two dollars; that is, the Bellefleur. It is a very sound apple.

The apple is the great fruit of the State, and barring, of course, the failures that may arise from the codlin moth, it will be a very successful fruit, but it has numerous enemies to contend against, and if we do successfully contend against those enemies, our fruit will be so much the more valuable on account of the loss of fruit in other sections of the State. I am a firm believer in the future of the apple on this coast in favored localities.

G. M. GRAY: I cannot agree with all that has been said. I have met with the very best success in planting pumpkin vines among trees, and I would recommend it, and I think every one who tries it will approve of it. It will keep the trees from burning and the ground from baking. The ground is able to retain its moisture. The best way it to plant one row of vines between two rows of fruit trees. Of course the vines must not be allowed to run up the trees and damage them in that way. We find that the large green leaves absorb the heat, thus keeping the ground damp, and where I have tried it, the young trees have grown faster and made more vigorous growth than where they were not associated in the same piece of ground. I would recommend the raising of strawberries or any kind of small fruit among fruit trees. My experience in early days in growing currants and other vegetables for the San Francisco market proved a success.

MR. JOHNSTON: My opinion is that planting small vegetables under the trees does not do any injury to the soil or absorb anything from the soil that would do injury to the trees, but my advice is to plant the trees a longer distance apart, and then plant such products among the trees as will enable a man to keep up a little with his expenses while his fruit trees are growing but before they come to bearing.

MR. WILCOX: My experience has been that it is profitable to raise other products in the orchard. My opinion is that these products do not absorb the same elements which are essential to the fruit trees, and, therefore, while you can raise a profitable crop, you are not much damaging your orchard, and if you can plant clover or grasses and turn them under, you can enrich your soil and get a good crop. In a strawberry orchard we all find it profitable and not hurtful to raise

crops among our bushes. I have raised strawberries, onions, and other vegetables. I raised \$3,000 worth of onions between my fruit trees, and that is quite an item on a sixty acre ranch, and I have contracted to do this again for another year. The roots of our trees grow below the orchard in which the strawberries feed, and then the onions grow between the rows, and I must say that it has kept my soil moist, and has, I think, benefited my trees.

SENATOR JOHNSTON: I am very glad Professor Hilgard made the remark he did concerning the diversity of soil. We have seen, the different views of the subject exemplified by the speeches of the different gentlemen here who have been tilling the soil in various localities. It proves that our soil is of such a nature, so diversified, that it is difficult for one locality to make rules for the guidance of another. In localities where water is scarce, for instance, I do not think it would be profitable to raise anything among fruit trees. They require, perhaps, all the moisture that the soil holds, in order that the trees may grow properly. In the locality where I live, where water is our worst enemy; where we have too much of it; where you can dig down to a certain level, not to exceed twelve feet, at any time of the year, and find water, and, probably, the roots of any plant would go down to the water. Soil tillage is all that is necessary, and you can plant as much on the soil as you choose, so that you keep it well tilled, and it bears a crop of vegetables; they will do well among young trees; they are of advantage, as they shade the ground. I find it profitable in planting any kind of vines. My favorite is the cantaloupe, or watermelon, or squash, but a vine is preferable to a potato, or bean, or onion, and we can make our orchard land more than pay its expense, until the trees come into bearing. The soil that will produce fruit trees, at all, has, naturally, water enough in it, if it is retained there, and if you keep it well tilled to keep the weeds down. That is more important than anything else. I cannot approve of planting currants in my locality, because they do not do well. We do not raise good currants there, but watermelons, cantaloupes, squash, or anything of a viny nature that keeps the sun's rays from the ground is certainly a benefit to us, while it more than pays for itself. Of course, if you allow your land to grow up in weeds, it will absorb the moisture from the surface, but at the same time it is exhausting your soil, and you receive no good in return. In our locality if you dig down you will find alfalfa roots and tree roots down in the water in the driest season.

MR. CHAPIN: The great difference of opinion that exists on these questions is such that often leads to a great deal of misunderstanding, because the expression of the opinion is given without the accompanying explanation. I am like Mr. Johnston in one respect. I do not care for potato or squash vines, or onions, or currants in my orchard, because it does not pay to plant them between the trees. Others may plant them, because it does pay them to do it. My neighbor Wilcox, though only two miles from me, has a soil where the water is right up to the top of the ground. He has artesian flowing wells that pour an immense quantity of water over the surface. He can grow strawberries, but I cannot. I would not attempt it, and I would not advise any one, under similar circumstances, to do it; and yet I can grow as fine trees as possibly could be grown down in his portion of the valley. Although I am but eighty feet higher than he is in elevation, right in the main part of the valley,

it serves to illustrate the principle, that when an orchard is planted, the peculiar local circumstances governing must be considered and must be acted upon. I must say, from my observations in every part of the State, as a general rule, more harm is done to orchards by planting crops of any kind within them than has been done by neglecting to do so, and by not keeping the orchard clean and free from weeds. The great principle to be followed in this State, in the case of orchards, is thorough cultivation, and we cannot be successful, in any case, in an orchard, without that thorough cultivation being carried out. We cannot grow wheat, grain, clover, and grass in our orchard, or in the warm parts of California, and succeed at all, as they do in the Eastern States. It is death to the orchard if it is attempted, and although these smaller crops, as squash and melons, may be suitable in many localities to raise, none of those crops are desirable—such as potatoes, beets, and currants, and the root crops which help to destroy the roots of your fruit trees. The best policy to be pursued in California is clean cultivation of the orchard.

MR. HAINES: Mr. Wilcox has a piece of very rich bottom land with abundant water. Like the original Nile, it can be flooded whenever he should choose. Senator Johnston has the same sort of soil, with water near the surface, so that the tree roots can penetrate to it. It is profitable for him to raise those sorts of crops, but he does not raise currants and raspberries, because it is unprofitable for him. Dr. Chapin is eighty feet higher than Mr. Wilcox, and he does not raise anything between his trees for the same reason. Now I reside about one hundred and fifty feet higher than Dr. Chapin, and I do not raise anything between my trees, for the simple reason that the soil is gravelly and they would not grow, and if they would, I would not raise them. Many parties have contended that the ingredients of the soil necessary to sustain these vast crops, are not of that nature which would go to build up a tree. They tell me if a peach tree dies, and if you plant an apple or plum root in the same spot it will grow; for instance, a great tree has grown and died there, and has exhausted the soil around; but they say, if you plant the same kind of a tree, it will take a long time before it will attain any size. If you plant trees, you are absorbing a certain amount of moisture, and parties who have made any efforts in dry soils raising crops between their fruit trees have failed. Parties coming from the East, where they put manure on the ground, and have constant rains that wash down and disseminate it through the soil, may expect it; but we have to contend with dry soils and dry Summers, and where the evaporating capacity is very great.

In the last few years, we have not had anything but surface rains, and hence there is a lack of moisture. Before the Convention adjourns they should touch upon fertilization in California. It is a very different question from fertilization in the East. There you can simply place your manures upon the ground, and they are constantly wet by the Summer rains. Such is the condition with the vines in France; they grow from the surface fertility. Suppose we take a tree and place manure on the ground around it—what is the result? In the early Spring these fibrous roots come up to the surface of the soil, but in the long period of drought which our orchards must sustain these roots must necessarily dry up; shrivelled up, they must absolutely die; and if you are endeavoring to raise upon the

land late peaches, or anything which requires a good deal of moisture you will find that while the tree will throw out its foliage in the Spring, in the Fall it will all wither up from the failure of moisture. Therefore, anything which draws off the moisture in the soil of dry land is fatal to the production of fruit. In the reports of this Convention, I think there should be a clear and explicit understanding that all the surrounding circumstances of the nature of the soil, etc should be stated, whether sandy, loam, or the water being within ten feet or one hundred feet of the surface, in order that the statement made should not mislead parties. Time and again I have seen parties injure themselves attempting to raise lesser crops between their fruit trees on a dry soil. The trees would be injured and the crop would not pay.

PROF. C. H. DWINELLE: Mr. President and Gentlemen—I have once or twice before, in a public manner, called attention to what, in my opinion, is the one great question for apple raisers of this coast. Can we find any remedy for the woolly aphis, or for the apple tree infested with it, or must we cultivate a stock which resists that insect as certain grapevines resist the phylloxera? The fact is, certain gentlemen have brought out stocks which they believed were aphis proof. Some of them, from very long experience, as Mr. John Llewellyn said, that in his experience seedlings from the Rawle's Janet and the Golden Russet were good stocks on which to work apple, as no material injury was done by the woolly aphis to those roots. Mr. John Rock, of San José, claimed to have picked up a seedling on which he had never found a woolly aphis in his experience. Since then certain stocks have been reported from Australia as having themselves proved perfectly resistant to this insect; and, aside from that, numerous experiments have been made with insecticides, and those which I am most familiar with were at the State University, made in our orchard with a view to the extermination of this pest on the roots. We know we can clean the tops of the trees by various washes, and particularly the very cheap one of tobacco. Now for a year or two past these experiments have been going on under the particular care and observation of Mr. Klee, the gardener in charge of that department, and, as such, is the person I would call upon to state the results of these experiments.

MR. KLEE: Gentlemen—I desired to have my experiments in a better shape than they are to present to you, but I will attempt to give you a short report of what has been done. The experiments, I confess, have not been fully successful. They seem to indicate that there are several things which might be successful, and, if followed out, they would probably do the work. The first remedy that was tried about a year ago was gas lime, procured from the Oakland gas works. It was put on in the month of December and was tried about six shovelfuls, within a radius of about three feet around the trees. It was forked in slightly, just allowing it to be covered with the soil, and immediately a heavy rain followed. Upon examining the roots two months later the result was that there were no woolly aphis to be found, while on the neighboring roots where no application had been made they were teeming with the aphides. Later however, a very serious result showed itself—the root prong of the trees had been hurt in a good many instances. The trees that had been injured were put back severely, and about one third of them

died; about two thirds of them recovered. I should have explained before this that the orchard stands on very unfavorable soil, and I attribute the failure with the trees and the killing of the roots not alone, perhaps, to the rather large dose of gas lime, but to the want of drainage, for the reason that all trees on sloping ground and on deeper soil were entirely unhurt, and although the aphid returned from above—the orchard being so well cleaned from the aphid in all directions, yet it did return, and came down to the roots again—it is an absolute fact that these trees were clean for the time being, and probably if all precautions had been taken, the aphid could have been kept away. While, therefore, gas lime may be a little dangerous, still I believe, used in moderate quantities, it would act not alone as a fertilizer, but that it has a tendency to kill the aphid, and if used in smaller quantities several years in succession, it would exterminate the insect provided it was not restocked from above.

Another remedy that was tested was the bisulphide of carbon. Owing to the variety of fruits in our orchard, and the small number of each kind, and our previous experience, I had become very cautious about applying it, and, therefore, waited until very late in the season, for this reason: that experiments in France had proved that the bisulphide of carbon—the liquid which has been used against the phylloxera—may be very dangerous if applied shortly before heavy rains, and for this reason the bisulphide was used very late. It was done in this manner: There were set off in rows from each tree holes about four feet apart; into these, by means of the so-called injector, which is used in France and also here for the bisulphide, was placed about eight drachms of bisulphide of carbon to each hole. In about three days this was repeated in the intervening spaces of holes, also being four feet apart. A day after we smeared the remedy over the trunks of the trees, and rags, soaked in the bisulphide, were placed around the root prongs. About six weeks or two months after I examined the trees and found them perfectly free from woolly aphid, but I must say in about three or four weeks after the woolly aphid seemed to have returned. From whence it came I cannot say. I do not think that it came from above, because of a very curious circumstance. In the early part of the year they seemed to be very numerous. I went there a couple of days afterwards, and found that they were disappearing very fast. I looked closer, and found that the lady bug was at work, and in two days the trees were perfectly clean. For this reason I do not believe that they were restocked from above. Consequently, there is only one thing which remains, namely: that the eggs were not killed. This, probably, is the reason why they showed themselves so very soon after, but it is a positive fact that no living woolly aphid could be seen there, and it consequently did away with them for the time being. It is probable that the bisulphide did not kill the egg in this case.

Another experiment was tried last year with lime. I believe it was not as good as it should have been, but it was used in such large quantities that it seemed to me if there was any good in the lime remedy it ought to have killed the woolly aphid. The soil around the root was removed, and about two large shovelfuls of lime were put in, and about two hours afterwards a very heavy rain followed, which completely slacked the lime and made a very strong paste around the tree, which made me think I might have hurt the tree; but the tree seemed uninjured, and a month or two afterwards I

examined the trees and I found the woolly aphid incrusting in the lime, but perfectly alive. This has been our experience there and if the failure is not due to the inferior quality of the lime, I cannot believe in the lime remedy—the remedy to which a great many have been pinning their faith. Probably others have tried it, and they may have had similar experiences. Our experiments of course, have not been perfect. We are laboring under a number of difficulties, having very few trees of a kind; and being afraid to try an experiment on all for fear we should lose the varieties. As it is, I think the first remedy may be successful on well-drained soil, but we have to be very careful with it. And it may be that the two, the bisulphide and the gas lime, may be used in conjunction with each other, the bisulphide for the deeper aphid and the gas lime for those on the surface.

MR. DWINELLE: A few days ago I met a gentleman from Los Angeles who told me that he had tried the remedy of wood ashes around the crown of the tree, and in such an excessive dose that he killed the tree; and two years after those trees were dead as to their main roots and tops, he found the woolly aphid out on the small fibers through the ground, so there may be some suggestion as to where the woolly aphid comes from when it is killed on the crown of the tree, and the fibers in the distance are left untouched.

MATTHEW COOKE: Mr. Cummings, of Sacramento, had some apple and pear trees which were badly infested, and Mrs. Cummings went out and dug a hole around the trees and put some lime in. She thought at the time she had killed the trees, and so she kept the matter secret from her husband; but to-day those trees are alive and vigorous, and to-day not a woolly aphid is to be found from top to bottom. Mr. Klee thinks the egg was not killed; but every day in the winter I can find the young woolly aphid on the trees, in the crevices and under the bark. On close examination through a period of eight or nine years, I have never found the egg of the woolly aphid anywhere, but on all days of the year, especially in warm weather, I can find the woolly aphid alive and able to be around, and I think the lime will act if properly applied, but it will require fresh lime. There are at least a half a dozen places I have tried it, and I know there is no woolly aphid now on the roots.

PROFESSOR HILGARD: I would suggest that the action of the lime is affected by the kind of soil; in our heavy adobe soils the effect would not extend deeper than the surface, and while in a lighter soil, being washed down by the rain, it might be very effectual, in adobe land, adjoining, it might be of no avail.

MR. CHANDLER: Two or three years ago I was recommended to use gas lime to destroy the woolly aphid. I got all I could from the gas works, and spread it several feet around the trees, so as to make the ground perfectly white, and even put it around the roots of the trees; and I even ordered my men to take common burlaps or sacks and cut them up, and rub with lime wherever there was a bunch of woolly aphid on the trees. That utterly destroyed them, and I have seen very few since above ground. But I see no difference except where they were destroyed by the friction and the lime together.

MR. GRAY: I have destroyed a great many of them by using coal oil and sulphur, applied to the trees with small brushes. That killed all I put it on. It was the only thing that seemed to penetrate into the cracks and hit them. I have also used gas lime, but never no-

ticed any damage to the trees from it. I have also dug the dirt away from the roots and applied ashes, although not of full strength. I think from my experience that we are able to check them, but it seems to be impossible to clean the orchard of them.

MATTHEW COOKE: Last Spring I made some investigations with the buhach mixture. We tried the buhach and alcohol on one tree very badly infested, and destroyed to a great extent the woolly aphids, but not entirely. Then we tried the extract in union with water, and found that it would not touch the insect at all; but the simon-pure extract, by just putting a drop of it in the center of a bunch of aphids an inch in diameter, on probably twenty trees, and it cleaned them off effectually, and they have not appeared since. I was up about a week ago looking over the trees. We applied the extract with one of these dropping glasses, and it run right through and destroyed the whole patch of them, say about one inch in diameter. Some fifteen or twenty trees were cleaned in this manner very thoroughly, but it is rather a slow job. Where the pure extract was applied, it destroyed the insects thoroughly, and they have not appeared on those trees since. But where the extract was mixed with one half water, it did not affect the insects.

MR. HATCH: But do they still exist on the roots?

MR. STRENZELL: There is no difficulty in destroying the woolly aphids on the tree, or on the stem of the tree, but it remains on the root. The main roots appear to be clean of the aphids, but if you go three or four or five inches from there the ground seems yet to be full of them. The trouble is that the ground is full of them, and wherever the trees are in that condition they begin to fail, and it is best to dig them up and destroy them. There is a space of six or eight feet around the tree, as far as the roots extend, perfectly covered with the growth of this aphid.

MR. BAIN: Last year my orchard was almost covered with them, and I took a neighbor's advice and washed the trees with concentrated lye. That seemed to revive them for the time being, except in isolated spots where the lye did not reach. But in the course of a month they began to multiply, and soon they were all over the tree as before, and I was so disgusted that I thought I would not have any crop at all. They became very numerous, and it went on so until in June we had three days of excessively warm weather, after which, to my great surprise and pleasure, there was not a vestige of them left. They seemed to have been literally cooked, and you could see the white film where they had been dried up. I hunted and scratched around for them, but could find no life; but in a month or six weeks, there they were again. They came up and spread all over the trees. My opinion is they came from the roots. In the Spring, in digging some twelve or fifteen feet from the trees, in order to plant other trees, I tapped roots that were literally covered with the woolly aphids; hence I think that they are alive on the tree underground in great quantities, and all we can do on top won't kill them.

MR. HAINES: I believe we have a dozen remedies which are fatal to the woolly aphids, but it will be difficult for us to exterminate them. We know the bisulphide of carbon is death to them, but if you apply it to a certain degree of density you kill your tree, and it is yet to be determined to what extent the ground can be surcharged with the bisulphide so as to kill all the phylloxera and not injure the vine,

and so with the woolly aphis. You may remove the ground around the roots and make all your applications, and yet there will be some little fibrous roots which you cannot reach, and which have sufficient insects upon them to repopulate the tree, and it is my firm opinion that however deadly the remedy, that we can never eradicate this pest from our orchards without incurring a greater expense than the orchard will warrant.

MR. DE LONG: As I understand it, if the woolly aphis continue it is death to the tree. I have not noticed it on our trees yet, but we may have it, and in case we are attacked with it I should like to know as to the probable length of life to the tree after it is attacked.

MR. COATES: I think the only thing to be done is to raise trees from the healthiest and strongest seedlings, and give your ground thorough cultivation and manure it well. I think if we go to the root of the matter you will find the most of the old apple trees in the State were raised on little cuttings; the roots cut up into little small pieces, and the trees are always in a feeble condition. Some gentlemen have testified that certain seedlings were resistant. That, probably, is only owing to their greater vigor. If a tree is raised on the strongest seedling, and cultivated well, I think that is practically the only thing that can be done. Trees that are so badly infested should be taken up and destroyed. I would ask the question, whether, if the ground is well manured and the trees are growing thriftily, there is no less tendency for them to be attacked by these insects than when the trees are in an unhealthy condition? I have heard the statement that the phylloxera is nothing more or less than the result of the running out of the ground. The theory may be advanced that if the ground is manured, and the trees growing thriftily, whether they would not cure themselves.

MR. VIOLET: I do not care how healthy a tree may be, if once attacked it will soon become sickly, and you cannot reach the disease underground. You frequently plow up small roots that are literally covered with the aphis. The gentleman that speaks of hot water treatment, must have applied it excessively hot, for I have put on boiling water with but little effect.

MR. SHINN: If the tree is from six to eight years of age, and is covered with the woolly aphis, you might as well take it up. You cannot get at a woolly aphis under the roots of an apple tree, but if you plant a tree that is free from the aphis when young, a sound healthy tree, and spread lime or even ashes about it, the aphides do not care for that tree; they will give it the go-by. If the aphides get on the top of the tree you can get them, but if they go to the root they go down to the bottom and you cannot dislodge them. So when you have got a young, healthy tree, keep the root covered six or eight inches around the tree with ashes—coal ashes will not hurt the tree and they will answer the purpose. Repeat this year after year, and do not let the aphis attack the tree, because if he once does so, he is afterwards your master.

MR. SHINN, in response to a question, said: I have occasionally seen the aphis on the pear root, but not often.

DR. CHAPIN: I have found the woolly aphis on pear trees, on the roots as well as the top; one of them in an orchard at Santa Cruz.

PROFESSOR HILGARD inquired whether the pear tree that was injured was situated near apple trees.

DR. CHAPIN: It was planted near an apple tree, but the pear tree

was not a thrifty tree, and it had the appearance of the neighboring apple trees.

In response to MR. DWINELLE as to whether the aphid bred on the top of the tree or on the root, DR. CHAPIN said he did not know.

PROFESSOR HILGARD: The whole subject resolves itself into this: It seems to me that there are remedies; that the insects can be subdued, but the main point now is to find some gentleman who knows the habits of these insects. When we have once discovered their habits, we can exterminate the insects.

MR. DWINELLE said that he had discovered the woolly aphid on the top of a pear tree at San Lorenzo.

MR. HUSSMAN: During a life-long experience as a nurseryman, I have had a great deal to do with it, and believe that the resistant stocks of the grapevine are our only hope against the phylloxera, and resistant stocks in apple trees are our only safeguard against the enemies which infect the apple tree. On land thoroughly clear from the forest, we planted seeds from our best trees, and generally raised stocks free from the woolly aphid, but in the damp, moist land woolly aphid appeared; and again in grafting, although the graft was free from aphides, yet the aphides always appeared in certain varieties of apples. Among those varieties the Wine Sap was the most prominent, but there were quite a number of varieties that would get the woolly aphid in spite of all we could do, while other strongly growing varieties, standing in the next row, would not get it. This led me to the conclusion that if we could discover stocks with the greatest amount of vigor and graft on them—vigorous varieties—we would have no great trouble with the woolly aphid; but I have no faith in finding a remedy against them any more than I have faith in any remedy for the phylloxera.

PROF. HILGARD: What do you think of the wild grape for a phylloxera-proof stock?

MR. HUSSMAN: Wild grape is very subject to it.

PROF. HILGARD: Did you ever see the Golden Russet have the woolly aphid?

MR. HUSSMAN: I cannot remember that I have.

An adjournment was here taken by the Convention until half-past seven o'clock P. M.

Evening Session.

FUNGI INJURIOUS TO FRUIT TREES.

[By DR. H. W. HARKNESS.]

LADIES AND GENTLEMEN: The subject upon which I have been invited to speak to you this evening is one of very great importance to those who cultivate the soil; indeed, it may be said that the loss to the agriculturist through the baneful influences of fungi far exceeds that caused by the insect pests, while to the horticulturist they must rank as second in the list of destructive agents. A few of the most striking examples of their injurious effects upon vegetation may not be out of place here.

Unlike ordinary plants fungi are destitute of chlorophyll, leaves, flowers, or of seeds, in the ordinary acceptation of the term, the reproductive bodies being known as spores, a name given to the

fruit of all flowerless plants. These spores are exceedingly minute, often not more than the five thousandth of an inch in diameter, are generally nearly transparent, extremely buoyant, and forming at all times a considerable proportion of the atmospheric dust, are transported by the winds to remote distances. These spores are produced in numbers which to one unfamiliar with the subject appear almost incredible. Nature seems to have provided with bounteous prodigality for the safety of species of the lower orders, both of plants and animals, and the number of germs produced is in almost constant ratio with the danger to which the organism is exposed. Countless millions of germs may perish but the species lives on.

As an illustration familiar to all, I will mention the puff-ball, the "smoke" from which consists entirely of spores, which, separately, are quite invisible to the naked eye, and each one of which is capable under favorable conditions of reproducing its kind. I have in my cabinet a single puff-ball (*Lycoperdon giganteum*) which is so abundantly supplied with spores that the entire State of California might be planted from this individual, each square inch of the vast area being supplied with a spore.

The consideration of these facts will explain why, when the conditions are favorable for the germination of an unusual number of spores, these microscopic organisms are able to devastate large areas in a single night, as often happens with fields of wheat, in which case it is only necessary in certain localities that there should be a warm foggy night, continuing for a few hours in the morning, and followed by warm sunshine, to produce the "red rust" of the grain, known to the mycologist as *Puccinia graminis*. Probably every one in hearing of my voice is familiar with the appearance of this parasite, which first shows itself as a minute rusty spot upon the leaf or stem. If it appears before the formation of the head it causes little damage, but if, as occasionally happens, it should attack the plant while the berry is in process of formation, it proves disastrous to the crop. In such localities the farmer soon learns to submit without repining to an evil for which no economical remedy can be applied, and to plant to other crops those tracts lying adjacent to the streams, which experience soon teaches him are most liable to be attacked.

Another fungus which endangers the wheat crop is the "white rust," or *Erysiphe graminis*.

This fungus is of a grayish white color, and attacks the leaves or stems, often encircling the latter at a point near the earth with a felt-like investment. It does not penetrate the cuticle to any great extent, but injures the plant by closing the stomata or breathing pores of the plant. Some years ago many thousands of acres of wheat in the Sacramento Valley were placed in jeopardy by this pest, the catastrophe being averted, as I believe, by a northerly wind of several days duration; nevertheless, the berry was shrunk to an appreciable degree.

Another of the well known blights which has been the cause of famine in Ireland, and has wrought incalculable mischief in other lands, is the fungus known as *Peronospora infestans*. Little complaint of it has reached us from the interior, but near the coast it has caused much by attacking the leaves and stems, and destroying them in a few hours. As yet it has not affected the plants early enough to prevent a partial crop.

Some twenty or more years ago the coffee plant was introduced into

the Island of Ceylon by the English. The first few years of its cultivation were years of success and prosperity; the tree was of luxuriant growth, the berry perfect, and the crop immense. It is not to be wondered at, that under such circumstances, and with the advantage of cheap native labor, the planter should have felt assured of fortune in the near future. But after gathering a few crops at great profit, yellow spots upon the leaves began to be noticed. These spots were examined with curiosity, but without apprehension, and received the name of *Hemileia vastatrix*. In a short time it spread from plantation to plantation, literally with the velocity of the wind. The leaves, exhausted by the fungus, shriveled and shrunk, and finally fell from the trees, leaving in many cases the exposed berry to shrink and droop, also its supply of nutriment being cut off, and itself left shelterless under the rays of a tropical sun. In this manner, and by means of this tiny pest, the crop was ruined upon many plantations, and rendered light and of poor quality upon others. In the first season of its prevalence the damage caused by it was estimated at \$5,000,000, and this is stated to be about the average loss for the past fifteen years.

Short of pestilence or famine, there is nothing more sad than the decay and death of a great industry. It is so difficult to uproot the old and plant anew. To the English planters of that delightful island the disaster has proved overwhelming, and a friend just from that place informs me that all or nearly all of the planters, who began with such high hopes a few years ago, are now bankrupt.

This fungus has extended beyond the limits of the island and attacked plantations upon the main land of the Indian peninsula. Where this scourge will end we cannot say, but it has not yet reached the fine plantations of Costa Rica and Guatemala, as I find no trace of it in a large consignment of sickly leaves from those localities.

Very many of our forest trees are attacked by fungoid diseases of various kinds. Several of the pines, notably *Pinus insignis*, the Monterey pine; *P. Sabiniana*, the Digger pine; *P. contorta*, tamarack; and *P. ponderosa*, the yellow pine, are all affected by a fungus which in the course of time usually kills the affected tree. It is found in knots and swellings, which are often three or four times the size of the affected stem or branch immediately above and below, and are sometimes three feet in circumference.

This fungus has been named for the author, *Peridermium Harknessii*. In the early Spring it is very conspicuous, the large swellings being covered by a powdery layer of brilliant orange-colored spores. The tree, incited to local growth by the irritating effects of the fungus, throws out layer after layer of woody material, which forms the bulbous expansions previously described. Those who have driven from the Hotel del Monte to the cypress grove at Monterey, will remember very many trees so affected.

The Douglas spruce (*Pseudotsuga Douglasii*), one of our most valuable forest trees, is subject to attack from a fungus named by myself *Dædalea vorax*, which is of a brown color and from three to six inches in diameter. It is found growing upon the tree just beneath a branch which has been for some time dead. By following this dead branch, the mycelium, which answers to the fungus root, makes its way to the heart-wood of the tree, where it quickly penetrates upward and downward for ten feet or more. Through this entire distance the wood-cells are impoverished by the fungus, and although

the tree may live for years thereafter, it is unfit for timber, and of little value for fuel.

Fir trees die by thousands from the effects of a fungus. My esteemed friend, Dr. Kellogg, our pioneer botanist, asserts that very few if any of this species ever die a natural death. In this instance, the fungus attacks the tree near the ground, or it may be fifty feet above it, and in its method closely resembles the *Peridermium* previously described.

By the irritation of the fungus, which encircles the trunk like a girdle, new wood is being continually formed over the space occupied by it, until by this means a great bulbous expansion is formed upon the tree. Meanwhile the mycelium is forcing its way towards the center, weakening the fiber of the wood through which it passes. This process takes years for its completion, but the trunk becomes so weakened at the point of attack, that it finally yields to the force of the winds, leaving that portion of the trunk which was below the fungus standing erect.

But by far the most extraordinary as well as the most obscure of the diseases of the forest trees, is that which attacks the cedar (*Libocedrus decurrens*). This fungus works within the living tree, perhaps for centuries, without the slightest external sign to indicate its presence. On making section of such a tree, we find numberless cavities, which, at the first glance, resemble those made by the larvæ of the boring beetles. On examining the contents of these cavities with a lens, they are found to consist of wood which has been killed by a fungus; the dead wood being somewhat shrunken, but the cellular structure remaining undisturbed. These cavities vary in size, but may be said to be from a half to an inch in diameter, and from one to three inches in length; the longest diameter conforming to that of the tree. They rarely connect; in almost all cases being separated by a portion of sound wood, and are invariably found in the heart-wood alone.

On placing a portion of the dead wood of a recently felled tree under the microscope, it is found to abound with mycelium, which has permeated without displacing the woody structure. The life history of this fungus is as yet unknown, as its fruit is still undiscovered.

Turning our attention now to those which more particularly interest the fruit grower, we find among the most conspicuous and destructive of fungoid growths, that known as

BLACK KNOT—(*Sphæria morbosa*).

This fungus is one of the few of those affecting fruit trees which destroy the tree as well as the fruit, and America may justly, though not exactly with pride, claim to be its home. It was carefully observed, studied, and named as early as 1822, by Dr. Schweinitz, a Moravian minister, then resident at Salem, N. C., where it was at that time doing great damage to the cherry and plum trees. It first appears as a slight swelling in the bark of the branches; the bark soon ruptures, producing irregular fissures, from one to three inches in length, which are quickly filled by the fungus. It usually encircles the branch with a corrugated unsightly mass, which in the early stages is of a greenish brown color, soft and velvety, and very much greater in diameter than the branch on which it grows. At maturity it is of a

shining black, marked all over with minute crowded papillæ. These little projections indicate the separate spore-bearing cavities, and are filled with a mass of oblong sacs called asci, each of which holds eight spores, and the whole mass thus contains a vast number of reproductive bodies. The branch upon which the unsightly mass has fastened is henceforth worthless, as the fungus appropriates all its nutriment, and soon kills it.

This fungus is now found in all parts of the country east of the Rocky Mountains, and Prof. Farlow asserts that one seldom sees a plum or cherry tree free from the knot.*

Remembering the great extent of country in which it is found, we can well believe that the loss occasioned by it is almost incalculable, for in all the infected district it is next to impossible to raise the better sorts of cherry and plum, and this has happened in a region well adapted for their culture.

The history of this fungus is very similar to that of the coffee. In both cases the disease belonged to a native plant, and on the introduction of less resistant kindred plants, was transferred to them, with what disastrous results we have seen.

So far it has not made its appearance in the orchards of this State, but there is every prospect of its invasion, as it was found by the author in the greatest abundance in Yosemite Valley. Any one who would like to see the probable future appearance of our cherry and plum orchards, has only to visit that beautiful valley and look upon the gnarled, twisted, unsightly, half dead and dying shrubs covered with black and warty excrescences, which mark its ravages upon the Choke cherry (*Prunus demissa*).

Recently it has reached us again from the Coast Range to the westward of Menlo Park.

It will thus be seen that it is already dangerously near our fruit orchards, and there is too much reason to fear that we shall soon have to contend with it, especially as our trees become weakened by age.

The opinion seems to be prevalent among our horticulturists, that it will only grow among the mountains of the State, and that we of the lower levels have nothing to fear from a fungus of such limited range. Unfortunately for us this comforting theory is contradicted by experience, for in the east it is found wherever the plum and cherry grows, from the mountains to the seaboard. It might be supposed that in the dry valleys of the interior there would be less danger than in the humid atmosphere of the coast—but there is an allied species which ravages the sage brush (*Artemisia Californica*) on the arid slopes of the foothills of Mt. Diablo, but as we are not greatly concerned about the fate of this odorous shrub it may be left unregretted to its fate.

The only remedy for this disease is the knife; the affected branch should be sacrificed, and if it appears upon solitary trees, it would be better at once to destroy the tree.

Pruning should be carefully done when the fungus is immature, and the spores not formed. It is always safe to do this before the fall of the leaf. The folly of pruning a tree of the mature knots, jarring and scattering myriads of spores, and afterward carrying them through the orchard before burning, may be readily appreciated.

* Bulletin of the Bussey Institute, 1874.

CAPNODIUM CITRI.

For more than twenty years complaints have been made by growers of the citrus fruits of the annoyance to which they are exposed by the prevalence of this fungus, which is known and has been described under several names—*Fumago*, *Antennaria*, etc.

It is found upon the upper surface of the leaves, the twigs, and fruit, and ordinarily appears like a stratum of soot, somewhat felted by extraneous matter. When in fruit, however, its appearance is somewhat different. Standing up all over its surface may be seen a great number of irregularly awl-shaped bodies, which open by ragged fissures at the apex and throw out great quantities of spores. The spore-cases are from one fourth to one half a line in height, and so may readily be seen by the naked eye. This fungus is an epiphyte; that is, it lives upon the leaf without drawing any portion of its sustenance from it, and does but little harm beyond depriving it of some portion of light and air, and rendering the fruit unsightly. The real culprit in this case is a coccus, the "scale," as it is usually called, and this sooty fungus advertises at great distance the presence of its more hateful ally.

It is often difficult to convince gardeners that it is not the excretion of the scale, but the real relation between them is that the insect exudes a sweet secretion which, dropping on the leaves below, furnishes a suitable nidus for the growth of the fungus, which is never found unaccompanied by coccus or aphid, and will, of course, disappear on the destruction of its insect friend.

Many species of *Capnodium* exist within the borders of the State, prominent among them being *C. pini*, which infests the pines of our park; *C. salicinum*, of the willow; *C. pomarum*, which abounds on heteromeles; *C. lanosum*, of the fig, etc. All of them having the same history as *C. citri*, etc., depending on the presence of similar insects.

RÆSTELIA CANCELLATA—(Apple Leaf Fungus).

This fungus is the cause of considerable loss to the apple growers in the Eastern States, but has not, to my knowledge, yet appeared in this, although from some reports which have reached me it may have done so. It makes its first appearance as a yellow spot on the leaf, which in a short time develops a number of little yellow tubes filled with orange-colored spores. As a rule nearly all the leaves of a tree being simultaneously attacked, and their vitality being destroyed, they turn yellow and fall, leaving the immature fruit (usually about half-grown) upon the tree, to linger for a time and share their fate.

The eastern mycologists, Farlow, Peck, Ellis, and others, consider this to be merely a state of another fungus which abounds upon the so called "cedar apples" which are found on the red cedar (*Juniperus occidentalis*). Should this theory prove correct we may escape the visitation, unless some other plant of our locality may serve as a host, which is quite probable, as I have found it upon our white cedar in the Sierras.

PODOSPHÆRIA KUNZEI—(Plum leaf blight).

This fungus injures very considerably the fruit of our wild cherries, and is occasionally found upon the domestic plum. In the early

stages it is quite conspicuous, being one of the "mildews" or white blights, the fruit, which is contained in minute globular receptacles, is seldom seen excepting by the mycologist. Little complaint has been made of it thus far, although it is capable of serious mischief.

SPHÆROTHECA PANNOSA—(*Rose blight*).

The white mildew of the rose is an *Oidium*, and is now known to be only the early stage of the fungus mentioned above. It is familiar to every one, and if it were confined to the rose, would be entirely out of our scope, but it is very readily propagated to others of the Rosaceæ, especially affecting the apple and peach, to both of which it does considerable damage. In its mature stage it forms a felted grayish mass encircling the twigs, and having imbedded within it the minute globular receptacles, each receptacle holding one ascus containing eight spores. Sulphur is used with some success in the early stages of this and allied species, and a wise precaution would be to destroy all roses which are subject to mildew growing near orchards. Roses vary very greatly in their liability to attack, and a little care will prevent much harm.

FUSICLADIUM DENDRITICUM.

This fungus appears as an irregularly radiating brown spot on the leaves of the pear, medlar, apple, and toyon, or Christmas berry (which is a near relation to the apple). It occasionally deprives the trees of more leaves than can be very well spared, but causes no very great injury.

ASCOMYCES DEFORMANS—(*Curled leaf*).

More has been said and written about this fungus than of almost any other, and yet it is very imperfectly understood. It appeared in this State almost as soon as peaches were planted. I observed it first in 1855. Every one is familiar with its appearance, and it is almost unnecessary to describe it. The fungus consists of a stratum of closed tubes, closely packed side by side, and standing erect on one or both surfaces of the leaf. These tubes are asci, and each of them contains eight spores. As a square inch of the leaf surface contains some hundreds of thousands of these asci, its great fecundity may readily be appreciated. Before the curl has reached maturity it is of a pinkish-gray color, and somewhat velvety; the excessive growth of mycelium swells the leaf into a misshapen mass, the veins being firmer do not yield so readily, and the leaf is drawn into folds and pouches. As the fungus matures the spores are discharged by the bursting of the asci. These often accumulate as a white powder in pouches and convolutions of the leaf.

The only remedy ever yet suggested for this disease is the removal of the affected leaves. It could probably be exterminated in this way as mustard is by the wheat farmer. Unfortunately the labor involved in such an undertaking renders it out of the question in ordinary cases. Let it be remembered that it is almost useless to remove *any* fungus which has matured its spores. Certain varieties of the peach show much more resistance than others, though this

resistance probably varies under climatic conditions, and more or less with the age of the tree.

It may not be out of place to mention that most of the oaks of California are affected more or less by a similar fungus (*Ascomyces Quercus*) which no doubt often greatly diminishes the crop of acorns. The white post oak (*Q. Douglasii*) suffers particularly from it, although on account of its firm texture it does not curl like the more delicate leaf of the peach.

The ascomycetes are gross feeders, if such a term can properly be applied to a parasitic fungus—that is, they abstract from the tree a very large amount of nutriment, and rapidly exhaust their host.

PHYLLOSTICTA CIRCUMSCISSA—(*Apricot fungus*).

During the past season complaint has been made of a new disease, which has appeared among the apricots, and caused much injury. The first specimens were sent to me by Prof. Dwinelle, and were destitute of fruit; but on visiting the orchard of Mr. Daniel Bidwell, in June, I succeeded in obtaining the fungus in fruit, and so was enabled to determine its character. It appears upon the leaves as irregularly rounded spots of a dark brown color, varying greatly in size. The spores are developed beneath the cuticle in black specks scattered over both surfaces of the spot, and on arriving at maturity rupture their covering and are borne away by the air. The mycelium penetrates through the cells of the leaf with great rapidity, sapping and exhausting them. The contracted cells separate from the healthy parenchyma, and fall to the ground, leaving the leaf perforated by holes, from which it has received in Australia the name of "Shot-hole fungus." Reports reach us from that place of the injury done to their apricots by it, but so far no remedy has been suggested. I have observed the same fungus upon the cherry, but no reports of injury to this tree have been received. Among the apricots, however, it appears to be working great mischief; appearing as it does when the fruit is immature, it so far injures the leaves as to arrest its development and leave it quite worthless.

UROMYCES PRUNORUM—(*Prune Rust*).

This fungus is found upon the leaves of the plum, and was first brought to my notice (in this State) by Dr. Chapin, who informs me that he has collected it this Autumn in Santa Barbara and again at Haywards.

It makes its appearance as a rusty brownish spot on the under surface of the leaves. The spores are oblong, smallest at the base, grow in clusters, with a stem longer than the spore, and when examined with a microscope, bear a strong resemblance to sheaves of wheat. A variety of this fungus (*var. Amygdalæ*) was found by me in September, six years ago, growing in the orchard of Mr. Reed, in Yolo County, on peach leaves, but neither variety seems as yet to have done much harm; but should it make its appearance earlier in the season, would doubtless injure, more or less, the value of the fruit.

I have attempted to give you a brief description of a few of the more familiar fungoid pests. In doing so I have avoided all mention of those of the grape, which has a literature of its own. The

subject is an inexhaustible one, as may readily be seen from the fact that all plants of the higher orders serve as hosts for from one to fifty parasitic fungi.

At the conclusion of the lecture, MR. COOKE said: Of all the fungi which have been described this evening, there is no one which interests so many of us here as that of the apricot. About four years ago we first noticed the holes in the leaves, and since then it has probably spread over fifteen or twenty counties. This is a difficulty which interests apricot growers more than any others, for it destroys their fruit. If you can give them any information as to how to prevent it, it will be of great service. You will find it in Marin, Sonoma, Yuba, Sacramento, and Placer. This last year its ravages have been terrible. Mr. Routier has suffered terribly, and he never heard of it until a few years ago.

DR. HARKNESS: The only orchard inspected by me was that of Mr. Bidwell, near Chico, and in that the trees were certainly planted too closely; and, it is possible, that wider planting may mitigate the evil. At present I can suggest no other remedy. Allow me here to make a few remarks not strictly pertaining to this subject. I should like very much to obtain specimens of this shot-hole fungus from various localities. It must be gathered before the fungus falls out, as it may readily be seen that a hole does not offer much room for study. The leaves should be pressed in a book till dry before sending. All specimens should be sent to the California Academy of Sciences, and the name of the sender attached, for it is often desirable to communicate with those sending material. I also particularly desire to receive earth fungi—growing beneath the surface of the ground. Such things, no doubt, are frequently seen by many of you, especially in setting out trees in new ground. I have no opportunity myself to examine the soil, and very rarely obtain them. Such fungi grow usually only a few inches below the surface, and bear a superficial resemblance to tubers, or puff-balls. I am assured by French mycologists that truffles will certainly be found in this State, and as they are worth four dollars a pound in Paris, the finding of them would be a matter of economic as well as scientific importance.

WEDNESDAY, November 21, 1883.

The Horticultural Convention met this morning pursuant to adjournment, Vice-President Johnston in the chair.

An interesting and instructive paper on raisin culture was read, prepared by MR. J. E. CUTTER, as follows:

RAISIN PRODUCTION.

[By J. E. CUTTER, Riverside.]

Gentlemen of the Fruit-Growers' Convention:

Dr. Chapin has surprised the writer with a request for a paper on raisin making. This fact and his appreciation of the doctor's courtesy shall be the only apology for the presentation of this article.

Even the child likes the sweet raisin, but only man likes wine. Now since "the child is father of the man," it is proper to invite you gentlemen of the wine interest, to respectful deference while we discuss what suits the taste of your father, the child.

Doubtless less is known of raisin making than of other branches of viticulture. In this case the more abstruse is the better understood of the two divisions. Also, our advance in the raisin industry has lain as largely in the elimination of errors as in the acquirement of positive information. To review exploded errors is a waste of time; suspected ones need our attention, and the field of positive information calls for most diligent prospecting. Nor is it profitable to detail the routine of the business further than has many times before been done. With these remarks we will touch directly upon the subject.

We cannot hope for profit from dwarfed vines. Now it is a rule in vegetable physiology, no less than in animal, that while the thing is young, a good growth should be secured. At this time, nitrogenous fertilizers may, *probably*, be used to advantage on soils not rich in nitrogen, or already exhausted of it. At a later period, the vine tends to the production of fruit rather than of wood; hence need less of nitrogen and more of potash. The use of the former among bearing vines appears to cause the vine to cast its bloom and to produce mildew; the use of the latter fails to produce wood-growth. A neighbor illustrated the former to the writer's satisfaction, while he himself proved the latter in the following manner: A few Mission vines stood among his raisin grapes. These he dug out and replaced with young Muscat roots, and, as they made little growth the first year among the larger vines, he treated them with a liberal supply of ashes directly at the roots. The second season they still grew but little, but bore a (for them) large crop of full and handsome bunches of grapes, except that the berry was rather small. He improved the suggestion thus received by applying, the present season, wood ashes to the roots of all the older vines, with the apparent result of an increase upon a previous yield of three hundred and eight twenty pound boxes of raisins per acre. The vines were four years old from cuttings. Some may question whether the ashes really did any good in a soil already rich in potash, but it is evident that they *at least did no harm*. The grape was the Muscat of Alexandria, which, in this locality (Riverside), appears to be superior to any other used for this purpose.

The writer has so pruned as to form a very low vine—the principal head not averaging more than six inches from the ground, with some branches reaching above. If the vines be examined in the Winter when the foliage is off, it can easily be noted, that the largest and best canes grow low on the head, and, following out these canes to one and two feet distance, it will be seen that the heavy clusters and finest grapes have been cut from them. Nature thus indicates *her* way. I do not here refer to suckers, which I remove when appearing below the head of the vine. The writer has pruned to from ten to fourteen short spurs.

Another advantage of the low vine arises from the fact that its grapes receive during the night more heat from the earth, and thus the processes of growth and maturity are accelerated. Where irrigation is practiced, however, it will be necessary to guard against letting the water flow so near as to wet the grapes.

Summer pruning is a pernicious practice, whose ill effects are not

apparent the first year, but entailed upon the following one in a reduction of the vigor of the vine and the quantity of fruit. Many of the writer's neighbors were led to Summer prune. So far as known to him, every vineyard thus treated showed a diminished product in the following year. One gentleman tested it in his small vineyard but not in his larger one near by. Next year the larger increased its yield, while the smaller fell off. In his own vineyard the writer switches such shoots as cross the rows around lengthwise of them and confines them there with small sticks. He is thus enabled to cultivate one way, and most of the remaining ground is shaded.

Water is at once the most effective and the most dangerous agent in our hands. If used inopportunately, as when the vine is in bloom, great harm may be done, while its seasonable and *most liberal* use is indispensable to profit and success wherever mesa lands are farmed to the raisin grape. There are two periods which imperatively demand water. The first occurs when the moisture stored from the Winter flooding, or rains, has been exhausted by the growing plant. On well cultivated lands this will not happen until the bloom is past and the fruit is safely set. The second is when the fruit is softening and swelling in maturity. Another irrigation *may* be necessary between these periods. Here many meet us with the amazing objection that if we irrigate when the fruit begins to ripen the grape will fill with water which we must dry out in curing the raisin! But, my friends, the water that enters the grape, enters it for the express purpose of carrying in the solid elements that it holds in solution, and which are there converted to starch and sugar. The strictly watery grape is the product of a cold soil, permanently surcharged with water, and unfit for the Muscat vine. In speaking thus of the benefits of irrigation, the fact is not ignored that there are some warm lands that receive by capillary attraction a moderate subterranean supply of water and produce a fair quality of raisin.

Now for illustrations:

See, first, Dr. Conger in October "Rural Californian." Note particularly the effect of water upon *those end vines*.

A gentleman in this locality told the writer that he irrigated but once the past season; grapes small and shriveled; will not try that again.

In the season of 1882, the writer irrigated three times—about June tenth, July twentieth, and September first. Results have been before given. The present season he irrigated but twice after the vines commenced growth, and before picking the fruit. The dates were July seventh and August twenty-first. The crop, though not yet packed, appears to be the best that the vineyard has yet produced. Two other vineyards near by treated in like manner gave like results.

The vines should also be irrigated after picking the crop.

To sum the matter; irrigation should be timely, *heavy*, but not frequent.

The *full* ripening of the grape is a most important matter for consideration, and the more so as the market is flooded with the tart and skinny product of unripe fruit, and the industry suffers from the damaged reputation which such obtains. The producer dreads the labor and possible loss which the Fall rains entail, and so picks his crop in the earlier fine weather before maturity can give it weight and character and worth. Here patience needs "her perfect work,"

and will repay it directly in increased weight, and indirectly in intrinsic worth and increased demand. The writer once asked a vineyardist why Mr. ——— got a better price for his raisins than his neighbors. "Well," was the reply, "he is lazier than the rest of us, and does nothing till compelled to, and so his grapes hang and get ripe, and make a better raisin than we produce." Not laziness, but *ripeness* scored a point in my mind that time!

There exists a class of predatory vineyardists having little "plant" or permanency of interest in the industry, and intent, not only to gather the golden eggs, but to kill the goose lest she should be in other hands another year. These lease the insufficient attachments of some ordinary place, to which they add such hastily gathered appliances as are indispensable, and there manipulate the heterogeneous product of many small vineyards whose crops they have bought from those who do not care or who are unable to cure and pack their own fruit. The grapes run through all grades of fitness and unfitness, since they are compelled to pick both early and late in the season, and the badly-cured and ill-packed, but well-labeled, product is loaded upon a disgusted public as "California raisins." Meanwhile the merchant, intent on making a "corner," pays to these men a price that he refuses to the holders of the better, but smaller lots, and the producer is discouraged from attempting to do the best work. Repeatedly it happens that men who have done fine work get no more than those whose work was bad. We commend this point to the consideration of the dealers.

The fruit should be packed at the home of the producer, who should receive the profit, not only of raising, but also of curing and marketing the crop. Last season the writer found that sufficient grapes to make a twenty-pound box of raisins were worth to him, *on the vine*, one dollar and ten cents. His raisins were sold at one dollar and seventy-three cents per box.

The rich-fleshed Muscat is the foremost in earth's most celebrated line of fruits. From the hot Eastern home which its name denotes, and through centuries of cultivation, it has brought to us the surpassing excellence which makes it at once manhood's strong food and childhood's peerless *bon bon*. To us falls the double pleasure of enjoying the glow of one of earth's best climes, and of contributing to others from our stock of physical satisfactions.

At the close of the foregoing paper the following discussion took place:

MR. HILGARD: I may mention two points that struck me in this very able paper: First—Mr. Cutter mentions ashes as furnishing potash, but it furnishes a great many other things besides, and from my knowledge of Riverside soils I must dissent from his idea that it is the potash or wood ashes that produces the result. Ashes contain lime, phosphates, and a good many other things. I think that probably the potash helped, but I think that gentlemen would find themselves spending their money not to the best advantage if they should purchase potash instead of phosphates. I think the phosphates had more to do with it than the potash; still, that is a subject of experiment. In regard to irrigation, this paper strikingly illustrates what I have tried to impress throughout in my replies to letters and publications, namely, that the diversity of soils and circumstances requires to be taken into account. Now I have seen raisins

that were utterly spoiled by over-irrigation, the culture of the peach was so far diminished that it ranked only third rate, when land left accidentally unirrigated ranked first, at least raised first-class California raisins. It merely shows that in each locality and in each different clime it is necessary to apply all the means which we have for controlling vegetable development, and that no one rule will hold for all.

MR. JOHNSTON: What effect will coal ashes have, as compared with wood ashes?

PROF. HILGARD: None whatever. Coal ashes, as a rule, are not worth putting on any land except the heaviest adobe: they act only as so much sand.

MR. BLOCK: Would you recommend wood ashes mixed with bone and the two together applied at the same time?

PROF. HILGARD: There is nothing objectionable in mixing them together, but it would hardly seem necessary to use both. I think on our soils, as they are at present, either is sufficient. The time will come when wood ashes will be called for more than bone, but, so far as the present condition of our land is concerned, potash seems to be abundant and phosphoric acid seems to be deficient.

A gentleman asked: In your experience with the raisin grape and the Muscat of Alexandria, do you regard them any more liable to be affected by north winds than any other class of grapes?

DR. CHANDLER: My experience is, that the Muscat grapes were affected much more by the north wind than any other grapes that I had growing; perhaps in the ratio of one to five, both in quantity and quality. The blossom and the whole stem would be destroyed or injured by the north wind. In the northwest corner of our vineyard there was scarcely a bunch of grapes left on the vines.

PROF. HILGARD: I would ask Dr. Chandler if he speaks of the Alexandria Muscat, or the Muscatel?

DR. CHANDLER: I speak of the Muscatel.

PROF. HILGARD: While the Muscatel is rather a juicy grape and the Muscat of Alexandria is rather of firmer flesh, but not so juicy a grape, I think we may say that firm, fleshy grapes, such as the Muscat and Flaming Tokay, are little affected, while watery grapes, good for wine, having a firmer center, but surrounded by liquid substance or juice, are those more likely to be affected, and especially if they are thin-skinned, as wine grapes ought to be, as, for instance, the Berger. However, in a general way, I think, it may be said that firm, fleshy grapes are less affected than wine grapes. The Muscat, particularly, is one that is little affected, because it grows in very dry climes, and is everywhere cultivated where extreme drought is the rule.

MR. HUSSMAN: In regard to this question just brought up, about the effect of north winds on certain varieties of grapes, I think that depends entirely upon the stage in which those grapes are when the north winds come; for instance, this season, all through Napa and Sonoma Valleys, the Zinfandel was very much affected by the north wind, while the Muscats were entirely unharmed, because they bloomed later, when the Zinfandel were in bloom, or nearly so, when the north winds came. In other sections, the Muscats were very badly affected by the north wind; in fact, so much so, that two thirds of the crop were destroyed by it, while the seedless Sultana did comparatively well. So it is altogether owing to the period at which the north wind occurs, and to the development of the crop while the wind blows.

MR. BLOCK: I would like the opinion of Professor Hilgard in regard to the cutting back of the grapevine after the grapes form.

PROF. HILGARD: I think that is a question that depends entirely upon the variety of the grape and the local causes. I find as much difference in that one thing as in anything relating to horticulture. I am not able to find that any special rule holds good. I think it depends altogether upon the variety of grape and the climate.

MR. HUSSMAN: With regard to the Summer pruning, I can say that I have practiced it for two years now with very beneficial effects, but I believe it can be made as injurious as beneficial by deferring the operation too late. The common practice of cutting back the canes late in the season in July and August is wrong. My practice is to pinch the tops when we go through on the fruit bearing branches, and when the young shoots are from a foot to eighteen inches long; then I pinch the top of the young shoots, which are very soft at that time, and it can be readily done with the thumb and finger, and that has the result of starting the upper buds on those shoots, while late pruning in July and August has an entirely contrary effect.

MR. COOKE: In regard to raisins. About ten days ago I had a box of raisins from southern California sent via Central Pacific Railroad, to be exhibited at Chicago. When they opened them, they sent them to me. I found that in a five-pound box, eighty-one per cent were infested by the larvæ of a kind of moth. They have not been known in California before to attack raisins. It was first discovered in grain in the days of Æneas, on the island of Cerna, but of late years it was found by Dr. Brown in the East. I have never found it in California, until I found it on these raisins. There is one thing certain: there will have to be some mode of protecting raisins from the attack of these beetles. The beetles are about one eighth of an inch in length, and they destroy every raisin that they come on. In reply to Mr. Williams, I would say, that a year or eighteen months ago I was down in Fresno County and found a little beetle which was always supposed to live in flowers. About four weeks ago I got specimens from San Diego County. He sent me up a peach with three of them buried in it, and he said they attacked the peaches, apricots, and plums, and although he did not know of it himself, his son charged them with cutting off the young bloom on the grapes as soon as they formed. It may be that in Fresno there are some of them at work, as I have got specimens at Mr. Williams' place. They are called the horned beetle, and are a small beetle, about one sixteenth of an inch long. From San Diego I received peaches, as explained, containing three in a peach.

On motion of MR. MILCO, the paper was received and ordered printed with the proceedings of the Convention, and its author was tendered a vote of thanks.

A very entertaining paper on peach culture was here read by MR. L. W. BUCK, as follows:

PEACH CULTURE.

[By L. W. BUCK, Vacaville.]

The peach flourishes best on a deep sandy soil, although often profitable on a heavier soil if well drained; too much water in the soil causing the sap in the roots to sour and rot. In my locality (Vaca-

ville) the peach is raised profitably on the hills as well as in the valleys, although requiring more cultivation on the hills and generally bearing smaller crops, as there is less moisture and generally less strength in the soil.

To grow fine peaches three things are absolutely necessary: thorough cultivation, pruning, and thinning. Every one knows what it means to cultivate an orchard, but *few* know what it is to cultivate thoroughly. It is not only necessary to keep the orchard free from weeds, but the soil should be plowed and then cultivated during the Spring till after the rains have ceased, until it is thoroughly loosened and pulverized. The more thorough and deeper this is done the more moisture you will retain in the soil for use during the hot Summer when it is most needed. There is no variety of fruit grown in my locality that will show neglect as quickly as the peach, particularly the late varieties of canning peaches which ripen in August, September, and October, and are grown without irrigation. On irrigated lands I suppose the cultivation is not such an important factor, but with us it is a necessity. Every locality, and perhaps every fruit grower has a different way of pruning, difference of climate and soil requiring different methods. In some coast climates it may be better to have the sun penetrate to the inside of the tree as much as possible, while in a warm dry climate like ours, shade is a necessity; consequently we head in our trees from the start by pruning back very heavy each year.

In planting yearling trees we cut them down to about twenty inches above the ground, then allow only a few of the top buds to grow. At the end of the first year leave three or four branches from four to six inches long, cutting off everything else. The next year in pruning leave about twelve or fifteen inches of the new growth. You will then have a good, stocky, healthy three-year-old tree, ready to commence bearing. Now cut the top back again the next year in the same way, leaving about the same length of new wood, and cut back heavier each succeeding year as the tree grows older. A great many make the mistake of trying to get peaches from trees too young, and in so doing leave too much wood; as a consequence, when the tree is four years old it is ten feet or more high, and the cutting back then has to be done and the grower loses the most of a crop worth a great deal more than the one he gains from the two-year-old tree. There is no danger of pruning a peach tree too much. Cut off nine tenths of all the new wood and you will then have to thin your peaches. In pruning bearing trees I leave from four to eight inches of new wood, taking care to leave this on the largest, healthiest growth (as the largest canes invariably produce the finest peaches), and cutting out unnecessary and decayed limbs. In this State, nearly, if not all varieties of peaches, are inclined to overload, and it is only by very thorough pruning and thinning out that a peach tree will remain vigorous and produce a crop of fruit every year. I have this Summer visited an orchard of late varieties of peaches on as good land as there is in the State, which is less than ten years old, and has borne itself to death or nearly so. The trees began to bear fruit at three years and were well cared for, but after they had reached full bearing were not pruned or thinned sufficiently, and had overloaded for three or four consecutive years until this year there was no wood growth to amount to anything, and the peaches were not marketable

and had to be dried. Many such cases as this are to be seen almost everywhere. If any one supposes he can raise eight or ten boxes of peaches per tree, and keep it up after his orchard comes to full bearing, he will find too late how badly he was mistaken.

It is easy to raise fine peaches on young trees for two or three years; and then look out! I have never seen a peach tree injured by pruning, if done when the tree is dormant, and they should not be pruned in Summer; it checks the growth and causes dead wood wherever branches are cut off; but if pruned at the right time it seems to give the tree new life and vigor, and to produce good peaches it is absolutely necessary to keep up a vigorous growth, which can only be done by heavy pruning, and the lighter the soil the heavier the pruning necessary. And now, also—no matter how heavily you have pruned your trees—to have all fine peaches it is still necessary that you should thin your peaches after the fruit has set. This should be done as soon as possible after the fruit is as large as a hazelnut—in fact, before. I generally begin to thin as soon as the peaches are large enough to distinguish which are good. This thinning has to be done by picking off by hand the fruit where it is too thick. The thinning should all be done before the pit hardens, as it does very little good after that time.

It is impossible to give any rule for thinning. The way I do is to be sure and not leave any two peaches nearer to each other than four or five inches, and then occasionally count the number of peaches left on a tree and guide the men by that. I leave from three hundred to six hundred peaches on a tree, according to age and quality of soil, when the tree stands from five to ten years old. This will make from four to ten boxes of fine peaches, and your trees may be depended upon for just such a crop every year, unless *killed* or injured by frost or something else. Thinning has not generally been practiced in this State until very recently. But the day is not far distant when the fruit grower who does not thin his fruit will be unable to dispose of it at a remunerative price.

Does it pay to thin your peaches? The expense of thinning will be about ten cents per tree, or, we will make a liberal allowance, and call it two cents per box. This is for trees say six to ten years old. Now, a tree may be thinned as I have stated, and will produce as many and generally more pounds of fruit than one not thinned. A box of peaches contains from twenty to twenty-eight pounds, consequently, thinning costs about one tenth of one cent per pound. This year I sold my canning peaches to one of the large canneries; sold them on the ranch to one of the proprietors, who went all through the orchard and bought them all, only obliging me to throw out all so small that seven would not weigh a pound. I will state here that there was not one box in the lot so small as to take seven to weigh a pound. After having made the contract I showed him some white clings, which would have averaged one half pound each (they having been thoroughly thinned), and he said he would far rather pay five cents per pound for such peaches, than two and a half cents per pound for such as he had just contracted for, and if he could buy such peaches, he would not bother with smaller ones at all.

Now, as a speculation, does it pay, may be asked. I say, yes, even if it costs you twice as much to thin, and you do not get quite so much fruit.* If that fruit sells for twice as much it certainly is a good investment; and add to this the fact, that your trees will be

longer lived, and remain healthier, and also the certainty that within a few years small peaches will not sell, except at a very low price, and it would look as if it paid to thin thoroughly. I have had men come into the orchard, and when they saw the peaches my men had picked from the trees in thinning, would exclaim: "Why, you have ruined your crop; you have not left anything;" and yet, when they saw the trees with the fruit ripe, they would admit that the trees had all they were able to produce. There is no grower who will thin his trees enough the first year. It seems too fearful a sacrifice of imaginary dollars and cents after his crop is set, and it requires too much moral courage to pick so great a proportion off; but after he once sees the result, he will not hesitate the second time.

And now, in conclusion, I would say to all contemplating planting peaches: First select a good piece of rich sandy or loam soil that is well drained; then buy good healthy one-year-old trees, well selected as to climatic adaptation; plant them early in the season; cultivate them thoroughly each year, and be sure, in selecting varieties, that you get such as will be good to ship, can, or dry. And here let me say, I believe the fruit interest will be as materially advanced by improving the quality of peaches raised as by any one thing we can do. We can, if we will, raise a peach in the sections of the State adapted to it that cannot be equalled in the United States. And it is equally as important that we make a reputation for our dried peaches as our canned peaches, and I believe the time not far distant when we will take our largest and finest peaches to dry, and that we will prune and thin as carefully for drying as for shipping for the market; and by using only such peaches carefully selected and carefully dried and put up in a box of uniform size, plainly branded with the packer's name, we will receive as much money, and possibly more than we are now getting for the same from the trade or canners; at least after a little experimental labor, we will be able to say to *all buyers*, unless we can get a certain price we will dry our peaches, with a certainty of getting a fair revenue from our orchards.

MR. SHINN: The author's remarks are timely and directed to the practical culture of the peach. His views are correct. To do best with our peaches in drying they should be peeled. His remarks as to thinning a crop are also just and right, even if the fruit does look a little thin you will be glad of it, and in four years out of five I regret that I have not thinned them enough. Prune well and cut back the first branches, leaving only a few buds, and next year thin back again. A peach tree soon gets its growth, and you want it to bear peaches and not wood. Peach culture is one of our most important industries. It is a great staple, and the most important fruit we have. The peach is not a long-lived tree, and its blossoms and fruit are all on the new wood.

MR. JOHNSTON: About what do you consider the life of a peach tree, and when does it become unprofitable?

MR. SHINN: I find that the early Crawford peach lasted under our care about twenty years. At the end of which time the branches would break off and become rotten. But I am satisfied with proper pruning they would have lasted another ten years. Every year I would send a man out to prune, and he would say, well, this must come off, until finally I had to have a long ladder to get the peaches. But every branch that was left produced peaches, and bore to the end; and you may cut off peach trees at any moderate age wherever

you please, and it will throw out more wood, and, if correctly pruned, I think it should last about thirty years. On the other side of the continent they sometimes last forty years.

MR. HAINES: I would ask, if you cut the tree back when twenty years old—cut everything off except the crotches of the tree two or three feet around the tree—whether it would renew itself.

MR. SHINN: I think when they are twenty years old that their vitality is pretty well departed; but I cut some of the trees off about breast-high, and that Summer they all threw out nice thrifty branches, and bore nice peaches. The next I cut off were black. I do not know whether they are dead or not; but whether it is practicable to renew the head of a peach tree when twenty years old, I do not know.

MR. BUCK: I prune the tree the first year after being planted. In the first place, I prune all but three or four or five sprouts, those I cut usually from four or five or six inches long, and as straight across the top of the tree as possible. The object is to have three, four, five, or six branches growing; and the next year I cut I leave about a foot or fifteen inches. The object is not so much to keep the tree down as it is to stiffen those main limbs that start off from the tree; and say we have three limbs, on each one of those three limbs I would leave two branches for the next year. At the second cutting, I would cut eight sprouts off, and the next time I would not leave more than two for the second year. If I had four or five I would not leave but two the first year.

Now there is another error that is practised by orchardists: that is, in cutting off all the inside branches as the limbs grow up, and after a few years you have quite a long limb with no lateral branches. If you will retain and cultivate the lateral branches you can cut back to four or five, or six or eight inches, and still you do not cut it far enough to get a dead limb, the sap of which will eventually run down into the heart of the tree and kill the tree. A peach grower said, "I cannot grow large peaches." I said, "What have you got?" He replied, "I have the Early Crawford." I said, "That is one of the best and safest peaches in the State." A gentleman visited our section and I took him around and showed him some of the orchards. At one of the neighbors we observed a fine crop of peaches, but the gentleman was thinning them out when this gentleman said, "You are not going to have any peaches this year." Then he said, "Too many; I am now thinning those peaches. All of these peaches you see here will come off to-morrow. Now, you count the peaches on that limb." "Well, there are some sixty or seventy." "Now," said the gentleman, "I do not want over three hundred peaches on that tree." He was right. The fruit grower wants to know how many peaches in a box, and how many boxes from a tree, and on good land you can force your peaches to the size of your boxes.

PROF. HILGARD: On good land or with good manure? I would ask Mr. Shinn if he has counted upon the liberal use of fertilizers. I must say, that in the Southern States, the life of a peach tree is very much greater than his estimate of it. A peach tree of forty years is not considered beyond a bearing age, but of course it is supposed that it is sound.

MR. BUCK: I have trees about thirty years old as fine as any in the State of California, producing well, and they have never been fertilized to my knowledge. A great many of them had been badly

abused by over-bearing before I went there, but the others are as good and as fine trees as anybody has in the world.

MR. SHINN: The southern peaches I used to know were seedlings, and were not grafted at all, and there seemed to be greater vitality to them. They do not attain such a large size; but they are generally clingstones, which, I think, is a hardier tree. On the subject of dried peaches: If we dry our peaches with the skin on, they do not bring half the price they do when we peel and dry them, and if we peel them and clean and dry them by some quick process, we will have a peach that will sell the world over. If we only build a little scaffold to dry them on, it will be better than nothing.

MR. HATCH: In regard to drying peaches and some other fruit, something was said yesterday in regard to fruit that was not fit to can, and was not fit to eat, but was only fit to dry. I think if we want a good reputation for drying, we ought, at least, to use that quality which is fit to eat, if not fit to can. I have seen unpeeled peaches sold at San Francisco at eighteen cents per pound, which seems to me very profitable, and peeled peaches from the same source brought twenty-five or twenty-seven cents; and it struck me very forcibly, that if we want to sell our dried fruits at a remunerative rate, they should be such as, before drying, were fit to eat.

MR. McDONALD: As one who is interested in fruit growing in Sonoma County, I will say, that in our section we take great interest in fruit raising, and this last paper interests us exceedingly, and to us will be very valuable. For myself, I feel amply compensated for coming here by hearing this paper, and wish Mr. Buck would have added a recommendation as to what would have been the best fruit to set out. We are setting out a great many fruits, and would like to know. I move that the paper be published as a part of the proceedings of the Convention.

MR. GLADDEN: At the San José Convention there were but three of us, while this year we have a number of representatives. We are particularly interested in peach culture. The peaches of the Russian River Valley, where properly cultivated, are not excelled by any peach in the State, and I am truly glad that such a paper as the last has been read, and I hope that all will profit by it. I would like to have heard in regard to the variety of peaches, and the distance apart to plant in different localities, and the different kinds of soil. In some localities they are planting fifteen or eighteen feet apart. In my locality I do not recommend planting nearer together than twenty feet. In regard to varieties, there is a great demand for the yellow varieties of peaches, and I will add that I consider it an important matter that we select for our planting the non-curling varieties as nearly as possible. In our part of the country we consider a peach there known as the Honest Abe one of the best non-curling varieties; also, Crawford. I would like somebody to tell me, on land that would produce from fifty to one hundred bushels of corn to the acre, how far apart to plant peach trees.

MR. WILLIAMSON: In regard to varieties, that must be determined by the locality. There are a few leading varieties, like the Crawford and the Orange Cling, and some other varieties, that will succeed most anywhere; but, as a rule, the safest and surest guide to varieties is to find out what is succeeding best in your own locality; and another thing we have got to consider in this respect is, what does the market want. Consult the canners; what kind of peaches do

they want. As a rule, they want large yellow peaches, but the present tendency is to want white, fleshy clings—white to the pit, and cling peaches.

I was East this Summer, and California canned fruit there had a reputation, and merchants told me that though there were canned peaches in the East that they considered superior to the California peaches, but, for all that, the California peach had the reputation, and they could sell nothing else. Well, said I, what kind of peaches do your people want? He said they most all call for Orange Clings. While now the commission merchants of San Francisco are in the habit of selling almost all yellow clings for Orange Clings, and there are a good many Orange Clings and a good many that are not Orange Clings, there are a number of California seedlings that are valuable. The Honest Abe I regard as a very valuable peach. I have seen other California seedlings, but I think the time is coming when the California seedlings will be the best peaches and the best adapted to our climate; but every man should consult his own locality and find out what best succeeds there. A gentleman observing a very fine peach in the Sacramento Valley, ordered and planted out a thousand trees of it, and in the locality it turned out to be a little, knotty, curly thing, whose fruit was not good for hog feed.

My idea of planting out an orchard is, and that is the rule I have adopted of late, especially where I want to plant apples, pears, and cherries, to plant first pears and cherries thirty-two feet apart. It will be some time before they want all that land, and there you can plant a row of peach trees. I would treat apples, pears, and cherries all the same way so that you will have just three times as many peach trees as you have cherry or apple trees. If you plant your trees sixteen feet apart, all of them, in my judgment, will do well, providing that your land is ordinarily strong during the ordinary life-time of a peach tree, until the time comes when the apple or cherry trees want all of the ground. That will come in ten years, and then you can afford to take out your peach trees. It is the sheerest nonsense to plant peach trees and let them lie idle. You can plant peach trees ten feet apart, and until you have got four or five crops, those trees will do well, and then you have to thin out. My idea is, where you are going to plant short-lived trees, plant long-lived trees among them with the view of ultimately thinning out the short-lived ones. And then again, while you have a diversity of trees they do better than when there is but one kind. I have my theory that the different varieties of trees abstract from the atmosphere, and, perhaps, from the soil, different properties and different kinds of nutriment, so that they do not do as much harm as all of one kind would.

MR. HAINES: We know we can produce the apricot and some other fruits in greater perfection than they can in the East, and the question is, after awhile, after the desire for California fruits, especially, has passed away, can we produce a peach here that will compare with the peaches in the East. They can lay it down at their own doors cheaper than we can, and I believe the time will come when the peach will not be the mainstay of canners, for I do not believe that the canners of this coast can compete with the canners of the East in the peach business. The apricots and other fruits which we can produce to greater perfection, will be our mainstay; and I think that question is worthy of discussion in this Convention.

PROF. HILGARD: Inasmuch as peaches are grown to considerable

perfection in the East, while as to some other fruits we have a monopoly in California, is it not better to pay more attention to those fruits of which we have a monopoly. I said yesterday that the European grape was one of those fruits, and the apricot was another; so I consider the apricot to be more certain of demand than the peach, though I think California peaches will hold their own at all times, but the distance and the cost of transportation are important factors to be taken into consideration.

MR. WILLIAMSON: I would like to hear the fig and olive question discussed before this meeting adjourns.

MR. SHINN: I think there is no better stock to graft for peach than on peach; for apple, than apple, and for plum, than plum. The peach will do upon almond root. There is a feeling abroad that it is preferable, and they want prunes grafted upon almonds, and almonds grafted upon almonds, and not grafted upon peach any more. But surely there can be no better stock for peach than peach.

MR. JOHNSTON: You spoke about the southern peach stock being the best, and Mr. Williamson thought that the California seedling was best.

MR. SHINN: I think in California we will depend mainly upon the fruits which have originated in California. We can now almost make a line of peaches that have originated here.

MR. WILLIAMSON: The question asked Mr. Shinn was, whether seedlings grown from seedling peaches were better than seedlings grown from budded or grafted peaches. I believe where fruit is large and well developed, the seedling to grow from is of but little account. The poorer the fruit, the better the seed, the stronger and healthier and more vigorous, consequently the most gnarled little peaches make the best stocks. We are sending East, to Utah, and other States, to get seeds from these old seedling orchards. We regard those stocks as superior to stocks from budded trees. Most of them will come up. They make a larger, more vigorous, and stronger growth and a longer-lived tree, and I think that accounts for the longevity of the peach trees in the Southern States. They have all been grown from seed. Peach tree is best to graft peaches on, although almond is good for dry land, and is an excellent root for the peach, but, above all, grow your peach trees on seedling stocks.

MR. WILLIAMS: I have used seedlings a great deal, and they develop a tree with probably more vigor. But as to peach, almond, and plum stock, we have to take the locality into consideration. In Fresno we have warm soil, and we want a peach stock, and you can't use plum stock. On cold tenacious soils, you want your plum stock, because they seem to be more adapted to that character of soil and the tree does better, and you should take those things into consideration in planting out an orchard as to the stock. As to varieties in fruits: five years ago we were none of us raising the white cling; I don't believe I sold a thousand a year, but since this little machine has been invented in San José, which takes out the pit so nicely, everybody wants clings. Now it would be very profitable to know what is going to be fashionable five years hence, and we should consider that.

The paper was adopted with thanks of Convention, and ordered published with its proceedings; and by resolution passed, Senator Buck was requested to furnish a supplement to his paper for publication as to varieties and distances.

In the absence of FELIX GILLET, his paper on the Codlin Moth was read by the Secretary as follows:

THE GREATEST PEST OF CALIFORNIA INSECT PESTS, OR THE CODLIN MOTH.

[By FELIX GILLET, Nevada City.]

MR. PRESIDENT: It is now nine years since this great pest, the codlin moth, was imported on this side the American continent, and in nine years it has spread near and far, pretty much all over our beautiful domain. To fight its onward march, check its ravages, and, if possible, annihilate this worst enemy of our orchards, Horticultural Boards were formed, and under their guidance and that of our leading horticulturists, the ceaseless fight commenced and has been kept on ever since, with more or less success.

This much we have found out, that if an orchard is located far enough from all other orchards, the codlin moth may be altogether annihilated. The scraping of the trees, and the entrapping of its larvæ under bands, would effectually do it. But there are very few orchards so located, and I may say that it is rather the reverse; for where there is an orchard, there are scores if not hundreds of them in the immediate vicinity or near enough, and from which the codlin moth is always ready to emerge to render our efforts at checking its ravages at home almost futile.

After starting from Central California, this pest spread in all directions at the same time, invading new districts every year. In that way it reached our mountains three years ago; and now it is just getting to the end of the State, to San Diego, where the people are meeting in conventions to devise means and adopt measures to stop, if it can possibly be done, and right at this early period, the invader's march, by the destruction of the entire apple, pear, and quince crop of the districts infested so far. Such is the situation made to California at the present day in regard to that great insect pest.

Now it must have occurred to the minds of a good many people, how is it that the codlin moth is making such depredations in California, increasing in numbers every year, while in other countries where the insect has also been noticed, its ravages are relatively insignificant and drawing but little attention. This point I had at heart to solve, to enable us to understand the situation made to us in California better and clearer.

In Normandy, in the northwest of France, and on the British Channel, grapes do not thrive well on account of the damp climate, and therefore no wine is made in that province; but in place of wine, the people of that country make an immense consumption of dry cider, which is drank at meals as wine, beer, or tea is drank elsewhere. This accounts for the vast apple orchards to be found right in that part of France. Well, how is it there with the codlin moth? In the most southern part of the province only, and at ninety miles from the sea, is the codlin moth to be found, and in so small numbers as to create no uneasiness among the Normandy orchardists. Why is it that the codlin moth will not go further toward the sea? And why is it that even where it has been committing depredations, instead of keeping on increasing in numbers, and spreading all around, it remains there, decreasing instead of increasing? This is

simply due to the climate, for there is nothing that the codlin moth dreads so much as a "wet Summer." For the last four or five years the Summers in that part of France have been rather damp, and had for immediate effect to chill out the codlin moth and almost annihilate it. A dry and warm Summer, though, might make them revive, and should it continue for several years the codlin moth would increase in numbers, to again decrease as rapidly should the Summers turn damp and wet again. Near the sea, where the temperature is at all times too damp, too chilly like, for the codlin moth to live in and multiply, that pest has never been found yet.

Thus we see that if the codlin moth dreads a damp and wet Summer worse than anything else, as being sure death to it, on the other hand it hails with joy a dry and warm Summer. This is the key to the whole situation, and it does explain why the codlin moth when it struck California struck a bonanza, and why, under our genial climate, our ever dry and warm Summers, it finds itself so much at home that it increases at a wonderful rate, and spreads around in an incredible short time. We might as well make up our mind now that the codlin moth will never let go its grip upon the orchards of California unless we introduce here, too, its "own parasite," wherever the said parasite can be found.

Too little attention and importance is given to those natural allies of man in the latter's big fight against those minute insect pests. Look at the phylloxera, which in the teeth of carbene bisulphide and other dreadful stuffs, has kept on its work of destruction, till those immense and old vineyards, the pride of France, have fallen a prey to that terrible scourge. The French Government for years have had a standing reward of three hundred thousand francs, or sixty thousand dollars, for the discovery of a radical remedy against the phylloxera. Nobody, so far, has applied for that much coveted prize; and it was but a year ago that the same French Government offered *at last* a premium for the finding of the phylloxera's parasite: three thousand francs, or six hundred dollars, being the paltry sum offered for the discovery of the only rational remedy to clean out this great grape pest. The phylloxera will probably never be subdued but through its parasite; and so it will be, I very much fear, with the codlin moth in California, whose breeding propensities seem to be decupled by the kind of Summers we enjoy here; and, by the way, that is one of the little inconveniences attached to our beautiful, rainless Summers, to have such pests breeding and propagating through it and at leisure.

If, however, we have to keep that pest here, we may be able of confining, for a certain length of time, at least, its ravages to those districts already infested, and so prevent its spreading to those portions of the State where it has made no appearance yet. But here we find ourselves with our hands tied up; we are powerless, and so are the State Board and County Commissioners. And why? Because we have no authority to enforce any quarantine laws. A bill, it is true, was passed by the Legislature on the last day of the session, but it found its last sleep in the Assembly Committee on Enrollment, where this bill that was providing the means for fighting and checking effectually the spreading of this and other pests got lost, strayed, or stolen. So we find ourselves to-day, with the pests spreading fast to those parts of California so far free of them, and no law to prevent their spreading from the infested districts.

An unusual severe frost, on the thirteenth of April last, killed our whole crop of apples and pears up here in the mountains, but with the good result of having pretty much starved out the codlin moth. Now apples are imported to this county from the adjoining valley county of Yuba; but so terribly wormy are those apples that the probabilities are that, through them, the codlin moth in Nevada County will make up for its losses by the frost, and next Spring again assail in as large numbers as ever our orchards, as if no frost had occurred early in the season, killing the entire fruit crop. We are powerless, and have no authority to stop the traffic of wormy fruit, and compel the disinfecting of boxes. And so it will be with the San Diego orchardists, where the codlin moth has just appeared, and where, with proper quarantine laws, it would be so easy to check the invasion, and drive that insect pest out of that county. In the absence of such a beneficial law their efforts will be very likely to be in vain.

In conclusion I will here state, that, in my opinion, to effectually fight or keep within bounds, if not exterminate, the codlin moth, the two best and rational ways are:

. First, by introducing into this State the codlin moth's own parasite, or any other parasites willing to feed on its larvæ;

Second, by the means of traps to catch the perfect insect before it has had time to deposit any eggs on the blossoms or young fruit.

To this end, we need the aid of the State, that ought, through the State Board of Horticulture, to offer large premiums for the discovery of the codlin moth's parasite, and premiums also for the discovery and invention of traps to catch the moths or perfect insects.

As to the checking of the codlin moth's ravages, we might improve a great deal on what has already been found, and in the meantime keep on scraping the trees clean, and using bands to entrap the worms. But do not let people think for a moment that an unfavorable season, like a rainy or cold Winter, will in any way affect the codlin moth. At that time of the year, the latter is only found in the larvæ state, in a warm, air-tight and water-proof little cocoon, whither it sneers at the cold weather and the rain, and the washes also, and even the attacks of other insects and birds; so well provided against all those contingencies is the little grub in its Winter quarters! So, I say, do not rely at all on a hard or unfavorable Winter to get rid of that special pest, but better rely on yourselves and your "luck."

On motion, the paper was received, ordered printed, and made a part of the proceedings.

On motion of MR. DELONG, the discussion of Mr. Gillet's paper was postponed until after the report of Dr. Chapin, State Inspector of Fruit Pests, should have been read.

THE NEED OF A GENERAL KNOWLEDGE OF INSECTS.

[ADDRESS BY PROFESSOR C. H. DWINELLE.]

Gentlemen of the Fruit-Growers' Convention:

I have not prepared a very elaborate paper on this matter, as I had not time to do it and meet all of my other engagements that were on hand at the same time, but I think in a few words I can say what I

wish, so as to bring a matter before you which I consider second in importance to none other in the fruit-growing interests of this State.

Many of the horticulturists of California know so well what they have themselves lost, and what evils they are threatened with through the want of a knowledge of insects, by themselves or others, that any discussion of the subject must seem to them superfluous. I regret to say, however, that I have frequent proof of the most lamentable ignorance of insects, and that, too, where such ignorance is a standing threat to the comfort and welfare of an entire neighborhood.

A few examples will suffice: At a meeting of the Sonoma County Grange, I was asked if there was any danger of spreading scale insects by nursery stock from an infected district, if such stock were not disinfected. A traveling tree seller had been in the neighborhood, who assured his customers that scale insects were found only in orchards, and not in the nurseries. My reply was simply to cite cases of serious loss through the purchase of infected nursery trees. Again, I am asked by persons intending to invest in vineyard property, whether the phylloxera is a serious threat to their chosen industry, and this is in the face of the numerous State reports containing maps and statistics showing the rapid spread of the insect, and the extent of the damage done by it. Every one who has carefully studied the subject knows that there is no practical and radical remedy for the ravages of the phylloxera in this State, although there may be preventives in the way of resistant stocks. I have seen it stated that the phylloxera is confined to a narrow belt, and that in the face of facts and published reports. If the belt is *narrow* I would like to own it, and then I would be the richest man in California. This is disputed, but still I am willing to argue the matter with anybody. I heard a gentleman at a former Fruit-Growers' Convention, a resident of the neighborhood, arise and say that we must have either disinfection of boxes, free boxes or something of that sort, to cut off this communication with San Francisco, and infested vineyards, and to prevent the spread of the phylloxera into the county where the gentleman resided; and that in the face of the fact that a searcher for phylloxera had found the winged phylloxera within rifle-shot of where the Convention was then sitting, and he, a fruit raiser, and perhaps a vineyard owner, was talking about the possible introduction of the phylloxera into his county. And, gentlemen, in view of the State reports, in view of the University pamphlet prepared and published by Professor Hilgard years ago, and spread throughout this State free to all who wished it, such ignorance is appalling; and yet, as I say, I meet gentlemen here that are going to put in their thousands in vine growing, and who ask me in earnest whether this insect is a serious threat to their business!

I hear also from the best authority that we have that there is no phylloxera in the southern part of the State, and consequently it is the place to go and plant vineyards. I hope it is, and so far as I know I believe it is, but on the other hand, I do not know of the slightest impediment to the introduction of the phylloxera into that district. What are the people down there doing to prevent it? Are they building up public sentiment? Are they watching the shipment of vines, or are there some of them who, through ignorance of insects and their ravages, are doing as the Spaniards did, when they dodged the quarantine existing between France and themselves, and thereby introduced the phylloxera into the Malaga district?

I say insects should be properly understood in this State and in this city, where our investors are putting their money into these viticultural and horticultural interests. I say the people when they go on the street here to buy fruit should know whether a pear is covered with crawling or fixed scale bugs. When they give fruit to their children to eat, as they do, many of them, without paring, they should know whether they are eating flesh with the fruit. And I would not have to go two blocks from this hall to bring you abundant specimens of such fruit as I have been talking about. I should say that the authorities of this State and city, through their Boards, should look after the health and the food of this metropolis, and they ought to know the difference between a clean pear and one that is incrustated with insects. Now we have been importing from every part of the globe the most choice and valuable additions to our horticultural resources. New fruits meet us on every hand. There is hardly a meeting like this in which we have not exhibited something new and promising. But we have also imported with these new luxuries pests which are going to cost the State inevitably millions of dollars.

For example, take the red scale, which was imported on a few citrus trees, and what has it done for the citrus-growing interests of this State? I have not all the facts before me, but I do know that, in about eight or ten months, one little settlement in one of our counties, bought, paid for, and used, over one hundred and five thousand pounds of whale oil soap, in fighting insects, mainly the red scale. I know also that the cottony cushion scale was imported in the same way on a few trees into the citrus-growing section, and it not only likes the citrus tree, but almost everything else, even the Monterey cypress, and not only will it infest the top but it will go at least eighteen inches, if not deeper, on the roots. It is the woolly aphid, phylloxera, and almost all other pestiferous insects combined, and I think it likes everything else that ordinary insects do. Are we going on in this way, importing new pests, or are we going to have a public sentiment which will demand a quarantine of every new thing of this sort which comes into the country from abroad, so as to protect our horticultural interests?

At the risk of harping on an old subject, I shall also mention the ignorance and prejudice which has too much prevailed in regard to the facility with which insects are spread in this State by our system of return packages. A man sends his fruit to market and gets the package back, and he thinks he saves a good deal, but the fact is, boxes are a frequent vehicle for the transmission of insect pests from one section of the country to another. I went into one of the oldest orchards in Sonoma County, and searching it from end to end, I could not find anything which I could identify as the codlin moth, but about eighteen months afterwards the owner told a friend that he had a worm in every apple. I had assured him he would have the pest in his orchard as sure as fate, unless the return box business was entirely broken up. Another gentleman, in the same county, endeavored to follow out the suggestion of the Board of State Horticultural Commissioners, and the people about him looked upon him as a bad neighbor because he tried to enforce all such regulations for the health of his orchard. Now they confess that he was right and they were wrong, but it is too late to keep the codlin moth out.

Very few of our so called educated men know the difference

between a bug and a beetle, between a worm and a caterpillar, a fly and a butterfly, and of course they don't know them by their technical names, and they say I have such and such a thing, and you say it is probably so and so, and they wander off in their description, and are so inaccurate that you cannot finally tell which of two or three orders the insects belong to.

Now, gentlemen, how is this ignorance to be overcome? You may answer: By having a State Board of Horticulture, which shall acquire and disseminate all possible useful information in regard to insects affecting horticultural interests, by Boards of Inspectors, and by horticultural and scientific societies all over the State, by State conventions of fruit growers, like the present. These are all good and useful in their way, and they have done a vast deal to remove the cloud of ignorance which overhangs our favorite industry, and I need not tell you that I have advocated and promoted them by every means in my power. But we must have something more sweeping and radical than all these; something that will reach the majority of all classes of the people, and not the mere fraction who now take sufficient interest in insects to make an especial study of them. As all classes may be instrumental in spreading insect pests, they should have a sufficient knowledge of them to appreciate their responsibility. To secure this end, the elements of general and economic entomology must be taught in the schools, both public and private. The minds of our youth must be acted upon at the time when impressions are received which are to last through life. We must begin at the foundation. The study of insect life, with its wonderful changes and thousands of beautiful and curious forms, when properly presented, is intensely interesting to most young people. Text-books could be prepared which would make the study one of the most popular, and give it more the character of recreation than of hard work, if taught by qualified instructors.

Just at this point a very serious difficulty arises, from the fact that very few of our professional teachers have studied entomology at all, and fewer still have made much progress in it. We must educate teachers in entomology, far enough at least, to make them safe guides to the young in the introduction to the subject. We have had some experience in this matter at the University, in the College of Agriculture. I found that my students, while they had the elements of zoölogy, had very little practical knowledge of insects, and consequently I took up, voluntarily, the task of instructing them, so far as time would permit, in the elements of this science, that is, elementary entomology, the structure and classification of insects, in a general way, and the application of the study to practical life; that is, economic entomology. I did this without being a professional entomologist, but having had an opportunity to study the science somewhat, under a very able instructor, and having taken a personal interest in the matter, I found that in a limited time very much good had been accomplished, and the agricultural students have gone out at least equipped to take up popular and scientific works, and the investigation of most any insect they come across, and protect themselves thus, in a way that an average cultivator cannot do. This has been found so far a success, and has become so popular with the students, that it has been made a regular requirement for the agricultural students in the junior year. Now this is good so far as it goes, but, as I say, I am not a professional entomologist, and I am not engaged

to teach entomology at the University. I have done it voluntarily. We ought to have a thorough entomologist to teach entomology to our horticulturists and agriculturists generally, and to those who are to become teachers themselves, as a large number of graduates take that course and become teachers afterwards. We want the very best man that can be had, who is a thorough entomologist, and who is in the prime of life, so that he has many good years of valuable service to give us, and who will come here with the understanding that he is to be an instructor in entomology as his great work, and not mainly to build up a great reputation as an original investigator, striving for fame by attaching his name to every little insect as the first discoverer. We have collectors and investigators of insects in this State and elsewhere, and they are good in their way, but that is not what I believe the State University just now wants. We want a gentleman who is qualified, and who will devote himself in every way to advancing entomological instruction, and will act for the good of the whole State, beginning, of course, at home, and also aiding in securing text-books and general instruction throughout all our schools.

It may not be generally known that a Chair of Entomology was created by the Board of Regents, some years ago, on condition that the State should appropriate the necessary funds to endow it. The State failed to do that, and I do not think that it will endow it for a long time, and in fact I do not know that it ought to. I have serious doubts on that matter. The State has done a great deal for the University of California, and I believe it is a proper thing just at this juncture for those who specially want general information on the subject of entomology, to be used in the line of their business, to put their hands in their pockets, and it is probably a very serious question whether it would not be the very best investment they could make, and put a few hundred, or a thousand, or five or ten thousand, according as they have been prospered, into an endowment of this chair. I see gentlemen here who could well have afforded to have done that ten years ago. It would have been thousands of dollars in their pockets, and I do not think they will question my figures. I have known of their spending \$1,500 in a month, apiece, in fighting their pests, which they and their neighbors ought to have known all about, and to have stamped out in their incipency. Now, this is a serious matter, and I hope you will give it the most serious consideration. Perhaps it would be best that a committee should be appointed to consider as to what can be done, and to canvass among all parties interested, and I am prepared to say that a certain gentleman is ready to put down a subscription in at least three figures, although he does not care to have his name mentioned, and I will guarantee that he is fully good for the money. The amount I will state to any committee that may have the matter in charge. I bring forward to you, gentlemen, a practical proposition for the good of this State, not only in future generations, but within your own time. Are you and your children, and your neighbors, willing to rest under the responsibility of having insect pests on your grounds and not adopting every practical remedy which is offered to you?

On motion, the remarks of Mr. Dwinelle were received with thanks, and directed to be printed in the published proceedings of the Convention.

PROFESSOR HILGARD: I wish to enforce what Mr. Dwinelle has said in regard to this matter. We have spoken of our future prosperity, but all the varieties are in danger of being wiped out, or made unprofitable by the presence of these insects. People receiving new plants from the outside are probably more aware than anybody else of the danger of receiving new pests. We are continually receiving new pests, and these will give the fruit growers hard work. I think this question merits great attention. In my opinion there is no question of greater importance, and it is proper for this Convention to give expression to its sentiments on the subject. The establishment of a chair of entomology at the University is of course one step in that direction; but the one who occupies that position should not merely confine himself to teaching, but he should be a State entomologist. It should be his particular duty to study the insects of the State and their peculiar habits and changes from their native countries, and so enable the fruit growers, by proper instruction, to attack the pest at the proper time, when it is most vulnerable, and destroy it. A State Entomologist would be most efficient, and one of the best paying officers a State could have. Another point is: Instruction should go right to the bottom of the social fabric in regard to this matter. It has been repeatedly said that we are going to be a community of fruit growers. We ought to instruct our children; we should introduce in the public schools instructions in regard to this matter to conduce to a general understanding of it. We cannot afford to leave our children in ignorance. Criticisms on the subject cannot reach every one as they should. There is an excellent book lately published by Mr. Cooke, which fruit growers should buy, and many a fruit grower will find there what will repay him a thousandfold in a single year; but unless what it teaches is brought before the public in a more effective form, I don't think the object will be met. We want to have it brought up before the children, and by competent teachers. The teachers that usually instruct them are not competent for this purpose. It is not enough to give a child a text-book, and tell him to memorize this and that, but we should teach him orally, and I wish we could begin at the University.

MR. COOKE: Gentlemen, I have listened to Professor Dwinelle's paper with interest. People of forty and fifty years of age cannot sit down and study economic entomology without taking two or three years of time; and I have come to the conclusion that our remedy is going to be in the public schools. A day or two ago a gentleman made a discovery of some insects in his orchard and sent them up to me to Sacramento to examine. To-day he has telegraphed to have them sent down, the case is so dangerous and demands such immediate attention. During the last five or six years I have done considerable work for the State in this way, and received three or four specimens a week from various sources. I believe the right road has been indicated—for the fruit growers to demand a Chair of Entomology at the State University. It may not reach everybody in the State directly, but it will indirectly through the teachers, and this subject must be taken up in the public schools. The future of California as a fruit-growing State depends on it altogether. The insect is the greatest enemy we have to contend with. The questions of planting and pruning are only secondary. The spread of pests in this State is far beyond the comprehension of fruit growers. We

have to begin somewhere. And your whole dependence is in Young America.

A gentleman called up to Sacramento to see me the other day to ask me but one question, and that was whether fruit growing was going to be overdone. I told him not before fifteen or twenty years. I told him that the fruit grower who would protect his fruit, and fetch clear fruit into the market, would always command a good price, and that the fruit grower who did not do it would command but a low price; and the increased acreage would make no difference. This subject is one of such breadth that it cannot be expected that a man of forty or fifty years of age could sit down and devote several years to it. The only salvation is Young America in the public schools. A plain primary book on entomology is very much needed. What has been written on the subject has been written in technical manner. Now, we want to get something that the children can understand. And as soon as you get that in the public schools, then California can proclaim itself a fruit-growing State; but the present generation is too old to devote the time to do it.

MR. A. T. HATCH here offered the following resolution:

WHEREAS, The fruit and vine interests bid fair to become the leading industries of this State:

Resolved, That we, in Convention assembled, as representing the fruit growers of this State, do urgently and earnestly request, pray, and by right demand the introduction into our public schools of the study of economic entomology.

Which resolution, after a very general discussion, participated in by MESSRS. HATCH, HAINES, BLOCK, DWINELLE, and McDONALD, was adopted.

After which, a recess was taken until one o'clock P. M.

Afternoon Session.

The Convention met pursuant to adjournment and was called to order by PRESIDENT WICKSON, who suggested that advantage be taken of a short delay in the proceedings to have a general discussion on any matters of interest which might occur to the members before the regular order of business was resumed.

VICE-PRESIDENT JOHNSTON here exhibited to the Convention two samples of sun-dried fruits, saying: We have here from the southern part of the State two specimens of sun-dried fruits, and, as they are so beautiful, it seems to me that we could not be better exercised than to have the two gentlemen explain their methods of drying. The fruit is simply elegant, and if these gentlemen can produce better dried fruit, or know more than we do on the subject, our time cannot be better occupied than in listening to them while explaining their processes.

MR. HIXSON: Gentlemen, I have simply submitted the sample for your inspection. If any one will call down at my place, I will explain to them, practically, the *modus operandi*. It is a very simple matter as practiced by the people who try it. It is usual to make a box that they can slide trays of fruit in, and when the fruit is first cut, just as soon as they get a box full, they slide it in on these trays. They use usually their raisin trays, and slide those in. They dig a hole in the ground, into which they slip their vessels that have burning sulphur in under the fruit, so as to have a little draft, and the sulphur burning fills the box with the fumes; and they let it stay

in there all the way from fifteen to thirty minutes, as the case may be. But Dr. Jarvis even let it stay in an hour, to see if it would affect the fruit, but says he never found any inconvenience; but usually a half an hour was the time he treated it. They then take their trays out and expose them to the sun; and if there is any fog or dew, or anything of that kind, they pile them up just as they do their raisins when there is likely to be a rainfall. The Lugonia Fruit Packing Company, that is now drying very extensively carload after carload of fruit—they didn't commence drying apricots in that way this year, because the process had not become sufficiently known to warrant them; but the gentleman told me that he had treated a few of his old apricots with good success. But he treated almost all his peaches in that manner, and he told me that he had got a very handsome price for them. He didn't show me samples of his peaches, but I saw samples at other places, and they are samples which I suppose were treated in the same manner. The main thing is to cut your fruit and sulphur it before it becomes too much oxidized, and just as soon as it can be submitted to a sulphur bath or fumes of sulphur. The process is as simple as anything can be; and where the fruit is immediately treated with sulphur, they claim that insects are not so liable to attack it, as when it is left freshly cut, open, and with the juice exposed. It has been in practice for several years, and this year is becoming quite common south of Los Angeles.

While remarking upon dried fruits, I would say that fruits similar to those samples were sold down there for eighteen cents; but I don't consider that any price at all if a man has enough of it to ship it East. Of course, with a small amount of fruit you cannot do much in shipping East, because the railroads want the biggest profit.

MR. WILLIAMS: The samples of sun-dried fruit which I have presented, were dried by one of my neighbors. He had a few boxes, and I asked him for one, which I put in my pocket to bring down here. They were exposed to the Fresno sun, which, if any one of you have ever visited us down there, can appreciate. We haven't much fog or moisture, and after drying the fruit it was submitted to the heat to destroy the egg of any fly that might be in the fruit, so that it would keep any definite period of time. We only dried three or four hundred boxes—ten-pound boxes—and a fruit man there offered me three dollars a box if I would furnish him a thousand boxes. That was three dollars for the ten-pound boxes. I would suggest that that fruit is not our canning fruit, neither is it the fruit that our Senator mentions. We could beat it, still it is not the canning variety.

MR. HAINES: I would suggest the necessity of submitting the fruit dried to the hot glass process. I think that is very important.

MR. JOHNSTON: The subject of drying fruits seems to me to be one of the most important for us to study and look into, especially those whose orchards are far from San Francisco. Those who are within twenty-four hours of the city can avail themselves of the published prices, but a fruit grower at a distance should have a system of fruit drying on his premises. There is not a year passes without some fruit being a drug in the market, and we ought to be able to dry our fruit at home. As I said, scarcely a year passes but what there is something—apricots, peaches, pears, or apples—which is a drug on the market, and will scarcely pay expenses, let alone any profit to the producer. Those within a hundred miles of San

Francisco, or within twenty-four hours of the market, can guard against it, if they are prepared with driers. The object of raising the fruit is to realize the most coin out of it. That is what we raise fruit for, and a few hundred dollars will erect some kind of a drier on each of our premises, and perhaps two days' fruit will pay all the expenses; and such a convenience will always obviate the necessity of our sacrificing a crop. We should study and look into which is the best principle of fruit drying to adopt. Our telegraphic and mail system are so perfect that we can keep posted as to the San Francisco market, and whenever the prices of fruit there do not justify us in selling, we can be prepared to dry our fruit, and when it is dry we have the world for a market, and we have a year's time in which to sell it if necessary. Now the matter of fruit drying will come up before this Convention before we adjourn, and I think this is an important matter to consider. There are a dozen different machines, and if we have nothing else we can take the rays of the sun. That is the next best thing, and perhaps the best. I think it is cheaper to dry fruit in machinery than in the sun.

MR. HAINES: Last Spring, at Riverside, I saw some fruit which had been dried by the same process as this on the table. It was on exhibition on one of their tables during their fair, and was prepared by the same process as this has been here. It seems to me that where they have Fresno suns it was well to utilize them in that respect. It certainly would be a great saving of fuel, where fuel is scarce; and I did not see any evaporated fruit that surpassed it in appearances made by any process now in use. If all parts of California were free of fogs it would be well to experiment with this plan. At night, before the dew falls or the trade-winds come up, it, of course, must be covered up, as they do their raisins in a vineyard. But in most every county in this State they get very good sun-dried fruit, though perhaps not of as attractive appearance or quite so good as this.

DR. CHANDLER: I have had some experience with sun drying, and also with a sun drier, and I find I make as good a product in the sun as I can in a drier, but I find no means of keeping my fruit away from the insects. The common house fly lights upon it, but bleaching and treating with sulphur will cause the flies to remain away and we can dry it without exposure to insects. That objection being removed there is no drier any better than the sun. Up through Sutter and Yuba the sun is so hot that it destroys all germs of insect life. I have exposed silk cocoons to the sun for two hours at midday and laid them aside, and not a solitary moth ever hatched from those cocoons, showing conclusively that they were killed. So if we sulphur our fruit and expose it to the sun to dry only during the heat of the day, before the moth or miller that produces the worm can get to it, we are perfectly safe.

MR. KELSEY: I prefer quartering to slicing fruits to be dried, as the latter seem to become tough and leathery, and do not retain their flavor as well. Chinese who dry fruit on the Merced River, tell me that they never take up their fruit later than three o'clock in the afternoon. If taken up later it got wormy, but taking it up between one and three o'clock, that it was never troubled with insects.

PROF. HILGARD: I saw a newspaper account of successfully drying fruit beneath white cloth which had been oiled to admit the rays of the sun more freely.

MR. HIXSON: I wish to show simply machinery-dried fruits by dif-

ferent machines, and I would call attention to this pear. This is the second year it has been on exhibition. It was taken to Los Angeles, and there exposed about a week with a box of them that I had, and after that I hauled it all over the lower country to show the people what they could do, and I want to ask you to note its condition now; how moist it is after that length of time. In regard to sun-dried fruit, I will say, that it was not covered by anything, and you can all examine it and see if you can discover any fly-specks upon it.

MR. HAINES thought it was better to dry fruit by an evaporated process, except raisins and French prunes. With the French prune it was necessary to go through a process of heating or boiling for the sake of the polish of the prune. The trouble with the evaporated prunes is that they are not all evaporated. They are packed immediately after coming from the drier, and some little spots are still green. It was his custom to place his dried prunes in a barrel for two or three weeks before time to pack them, and the larger fruit, which was not quite dry, gave up part of its moisture to the smaller prune which had been completely dried, and he had never found the slightest danger of mold.

A communication to the Convention of Fruit Growers concerning the Williams Fruit Drier, and extending a general invitation to all members present to call and inspect, was here read to the Convention by its Secretary.

PROF. DWINELLE moved that a committee of five be appointed to consider the matter of an endowment Chair of Entomology in the State University by voluntary contribution, and the committee to report to this Convention before its adjournment. The motion was seconded, and an amendment suggested that the Chairman of the Convention be added to that committee, which amendment having been accepted, the motion, as amended, was adopted.

The Chair appointed Prof. C. H. Dwinelle, Hon. William Johnston, Matthew Cooke, A. T. Hatch, and S. F. Chapin, to which number, in accordance with the resolution, President E. J. Wickson was added.

The order of regular business now being taken up, Dr. S. F. Chapin read his report on Fruit Pests, after the following introductory remarks:

Gentlemen, I would like to make first a brief statement, before proceeding with the reading of my report. I have endeavored, in the work that I have been trying to do in the State this season, visiting orchards, to give you as full and yet as brief an account of it as would be consistent under the circumstances. I hope you will excuse the length of my paper, as I have tried my best to condense it, so far as I possibly could and yet retain all the facts which I wish to present to you.

[This report is to be found commencing page 12.]

DR. CHAPIN: I think we have no hope of combating the codlin moth when we grow small crops between our fruit trees, which will rather harbor it, and allow the moth to escape and continue to infest the fruit; also, work should be done in connection with thorough cultivation by fertilizing the ground, and this not with new manure, but with old well rotted manure.

THE PRESIDENT here suggested that in consequence of the length of the paper and the numerous subjects treated of by it, as well as by the paper of Felix Gillet, it would be better to take up and discuss

the heads of the article seriatim; and in the first place, as one of the most important, the codlin moth.

MR. DE LONG: At the last Convention, which was held at San José, I gave a report of the manner in which we had warred against this insect—the codlin moth. My principal work up to that time had been, during the Summer, in catching the moth after he had got into our apple house, by closing the openings there, putting the key into the possession of one man, and from time to time, as the moths had hatched out, I had one man to go around to all these openings with a lamp, which attracted the attention of the moths, and killing them. He killed, one night, one thousand five hundred and seventy-nine of these moths. I stated we nearly exhausted the fruit crop of last year in trying to kill the codlin moth. My mode of proceeding was, to take the fruit and boil it and give it to the hogs. Last year the fruit was carried into the house and cleared of the codlin moth. After leaving the fruit it took great pleasure in rolling itself up into a little cocoon in the cracks of the floor, and, in fact, in every place, even going into crevices so small and compact that it was impossible to insert the blade of a knife. I will say here that all boxes were removed, and we thoroughly scalded every one of them, each one being subjected to this process at least three minutes with boiling hot water. The destruction of the moths that way was very large. The boxes showed plainly the presence of the moth, as it was rolled up in its small cell or cocoon. After we had killed them, the floor was cleared, when I took some caustic soda and made a solution as strong as I could with water—as much as the water would take up; then I poured it on the floor, and, with an old broom, worked it around, which had the effect to destroy all life there, and the result was, the killing of almost all the moths; those that were left had nothing to protect them but the crevices of the building and the brickwork. We killed eleven thousand nine hundred and twenty-six moths.

During the Summer I placed bands on all the trees, never but in two instances allowing them to remain there six days without examining them during the visit of the man; in one case seven, and in another eight days had elapsed before they got around. Of course their visits to these bands resulted in killing an immense number; the number of them I made no pretension to keep at all. In one instance we got thirty-two off of one tree in the morning, and in the afternoon we got twenty-seven more off the same tree, and they would get fifteen to twenty off a tree of an evening. The first and second crop, or the first and second brood, I may say, we handled easily—there were very few, but the third crop was immense, and where it came from, and how it got there, I do not know, and I do not think anybody else did. They do not seem to get into the apples; there was no show of them, but all we know is that when the third crop appeared the apples were all more or less affected. I picked over four thousand and eighteen boxes of Newtown pippins, and all the good apples I got out of them was fifteen hundred baskets. Of course, there were probably some small apples, but there were at least not over twelve hundred or thirteen hundred boxes that would not have been No. 1 good shipping apples. They were rendered almost entirely worthless by this insect.

The principal trouble seems to be that the broken apples and trees afford a shelter for the moths and it is almost impossible to cope with them. You cannot find their hiding places and you can go into the

orchard and cannot even find them; there is evidence of their having escaped, the chrysalis remaining, but the moth had abandoned it. I have left the bands on the trees and often I find an insect like a centipede on a very small scale. I find the evidence of the insects under the bands, and immense quantities of worms have been eaten out from their little cells. In one instance there was one about three quarters destroyed, and the centipede was in the cocoon with him. That was the only instance that I knew of their attacking the moths. When the moths are found under the bands they should be taken from the tree and destroyed or scalded, and in that way I think we will get rid of a large portion of what there is there, unless some of them have gone underground. I have been spoken to about putting pails or buckets to see if I could not catch them. I have never had any experience. Some were sent down to me, but I failed to catch any codlin moths in the whole lot, although I found thirty or forty moths in the bucket. If you put up a gross in your orchard and get only thirty or forty moths you would be well repaid for all your work.

MR. DE LONG being asked by other members to describe this enemy to the codlin moth for their benefit replied: They are from one half to seven eighths of an inch in length, of a dark color, not exactly black nor yet brown. I have seen them with white on them. There seems to be an innumerable number of little feet sticking out on both sides, and quite a sharp head, something very similar to the apple worm itself. I have not looked at it enough to describe it. I came away and forgot to bring one of the worms with me. There seems to be a little black beetle; it could hardly be called a beetle nor yet a cricket. It is about three eighths of an inch long; very narrow. I have seen it occupying the same place in the cell as this insect. I suppose there are large quantities of these under the bands together with the worms. Whether they feed on them or not I cannot tell. I am very careful not to destroy any of them until I find out what they are.

CODLIN MOTHS KILLED IN MR. DE LONG'S APPLE-HOUSE.

Closed the apple-house April 15, 1883:

April 15 to May 15—Killed moths.....	86
May 15—Killed moths.....	7
May 16—Killed moths.....	8
May 17—Killed moths.....	6
May 18—Killed moths.....	20
May 19—Killed moths.....	32
May 20—Killed moths.....	16
May 21—Killed moths.....	43
May 22—Killed moths.....	54
May 23—Killed moths.....	35
May 24—Killed moths.....	28
May 25—Killed moths.....	133
May 26—Killed moths.....	67
May 27—Killed moths.....	84
May 28—Killed moths.....	194
May 29—Killed moths.....	31
May 30—Killed moths.....	48
May 31—Killed moths.....	53
June 1—Killed moths.....	38
June 2—Killed moths.....	42
June 4—Killed moths.....	275
June 5—Killed moths.....	308
June 6—Killed moths.....	182

June 7—Killed moths.....	517
June 8—Killed moths.....	425
June 9—Killed moths.....	409
June 10—Killed moths.....	161
June 11—Killed moths.....	422
June 12—Killed moths.....	189
June 13—Killed moths.....	457
June 14—Killed moths.....	182
June 15—Killed moths.....	436
June 16—Killed moths.....	307
June 17—Killed moths.....	236
June 18—Killed moths.....	372
June 19—Killed moths.....	150
June 20—Killed moths.....	130
June 21—Killed moths.....	185
June 22—Killed moths.....	167
June 23—Killed moths.....	380
June 24—Killed moths.....	123
June 25—Killed moths.....	140
June 26—Killed moths.....	425
June 27—Killed moths.....	290
June 28—Killed moths.....	286
June 29—Killed moths.....	315
June 30—Killed moths.....	327
July 1—Killed moths.....	295
July 2—Killed moths.....	492
July 3—Killed moths.....	347
July 4—Killed moths.....	252
July 5—Killed moths.....	206
July 6—Killed moths.....	261
July 7—Killed moths.....	175
July 8—Killed moths.....	57
July 9—Killed moths.....	106
July 10—Killed moths.....	87
July 11—Killed moths.....	93
July 12—Killed moths.....	111
July 13—Killed moths.....	36
July 14—Killed moths.....	49
July 15—Killed moths.....	36
July 16—Killed moths.....	113
July 17—Killed moths.....	19
July 18—Killed moths.....	44
July 19—Killed moths.....	48
July 20—Killed moths.....	53
July 21—Killed moths.....	
July 22—Killed moths.....	
July 23—Killed moths.....	
July 24—Killed moths.....	36
July 25—Killed moths.....	
July 26—Killed moths.....	
July 27—Killed moths.....	57
July 28—Killed moths.....	40
July 29—Killed moths.....	23
July 30—Killed moths.....	19
July 31—Killed moths.....	
August 1—Killed moths.....	7
August 2—Killed moths.....	
August 3—Killed moths.....	
August 4—Killed moths.....	
August 5—Killed moths.....	11
August 6—Killed moths.....	37
August 7—Killed moths.....	24
August 8—Killed moths.....	
August 9—Killed moths.....	
August 10—Killed moths.....	
August 11—Killed moths.....	8
August 12—Killed moths.....	3
Total.....	11,974

MR. BLOCK: The reason I asked Mr. De Long to describe that worm is, I have watched the same thing, and I supposed it was the

codlin moth which had thrown its skin, and I destroyed them wherever I saw them.

MR. HATCH: I think if any one would take a centipede and put it under the wrong end of a field glass they would get about as good an idea of this worm as they could in any other way.

MR. COOKE: Mr. Alexander called my attention to a grayish maggot. Some of these insects have two legs on each section, and others four legs on each part of the body. The one that he spoke of having so many legs, belongs to the scorpion family, and they are all predacious. They have about twenty-two joints, and one leg to each joint, and when with four legs to each joint they are myriapodal, but the other belongs to the beetle family, and is predacious also. I have no doubt in the world that they eat into the cocoon and eat the larvæ in the nest. I think there is no doubt that this scorpion also goes in there and destroys the larvæ.

MR. HATCH: The first tin can or box I ever saw used was in an orchard in Solano County, and the proprietor informed me that he had caught a great many codlin moths. Those he had been catching were about the size of the first joint of our little finger, which led me to believe that they were not codlin moths, as they did not fill my observation of it, yet a short time afterwards in passing another orchard, I asked him to get me one of the cans, which he did. They had been there but a very little while, as the fluid had not evaporated, and it did not appear as it would after several days of exposure, and yet there were eight codlin moths and nothing else. They were on the surface of the liquid, and the tips of their wings had not been discolored or come in contact with the liquid, so they showed distinctly what they were. On looking in another can he said it had about the same number, and that led me to believe that they were of some efficacy in catching the codlin moths. I then had two thousand made, which I hung in different parts of my orchard in the trees, and I visited them occasionally and found a few in almost every can. I did not consider it, however, a specific remedy for the codlin moth. I used in connection with that almost everything else that I had heard of as a possible method of destroying them. I did not want to depend upon the cans, nor the bands, or washing trees, or destroying all wormy fruit, but I am ready to try anything that any one may suggest, together with all of them.

MR. BROCK: I started in by making a whale oil soap, and applied it, boiling hot, to the trees, and believe I have destroyed a good many by cooking them in that way, and we have picked off a great many codlin moths; and I have washed the trunks with a strong decoction of lye, and have destroyed a great many in that way. From an opinion of Mr. Dwinelle's, last year, I followed his advice, and put lighted lamps in the orchard, but it worked with poor success. I tried it again this year, and met with very good success, and although it is a good idea, you must not depend too much on it. I used a large tin, in which I placed a lamp, and filled it with water nearly full, and put a little coal oil on top. The moth at night is attracted by the light, and I found, the next morning, from sixty to one hundred and twenty-six moths—not the codlin; they do not always fly alike. I found, on two succeeding nights, almost as many as I have mentioned; then again for ten days or two weeks I would find hardly any, and it was not worth while to light my lamps. Then again a flock would come, and my idea is, the codlin moth comes in swarms

or flocks. When the first hot weather comes, those most exposed to the heat probably come out at that time, and consequently, if you have your lamps lit at that time you can catch a great many of them. Then again, for a long time, you won't find any, and then there will be a swarm come along, and I think the second swarm comes from the previous year's crop, which had been hidden, probably, in some place, say on the shady side of the tree, and did not have as much sun to come to maturity. It is not necessary for you to change your lamp; you can fill your tins sufficiently, so that they will last for two weeks. I have caught a good many other kinds of moths besides the codlin; but you will find the lighting of the lamps probably quite advantageous, though you might light them for a week without catching any; but it is worth the trial.

MR. —: Last year I bought what is called a codlin moth wash, and which, it was supposed, would go a long way towards getting rid of the moth. I put one pound of it into a gallon of water, and to that I put strong potash, say one pound to each gallon of water, and applied that to the trees, with no earthly effect at all. I took apple boxes and poured it on to them and left them standing for a great many days, and it had no effect at all on these worm cells. The little cocoons were proof against the strongest wash. It is almost impossible to penetrate them or wet them through. I have used caustic potash so strong that it would take the skin off your finger, and I have put it on the cocoon and left it on, and in a few days went back and the worm was as lively as ever. When the worm is in the chrysalis form we have no means of reaching it except by sending men around the trees to watch the crevices and cracks and pick them out. It is useless to wash the trees.

MR. THISSELL: Two years ago I tried to exterminate the codlin moth. My object was to try and save the few apple trees I had, and I can say that I succeeded beyond my expectations, and I would like fruit growers to see my trap, as they can then understand its merits better than I can tell them. This is the trap, gentlemen: it consists of a circle of tin, disjoined on one side, which I can place against the tree as a collar; around the top I attach this piece of canvas sack. This trap is pressed into the ground at the roots of the tree, just deep enough to prevent the miller passing underneath the ground. I fill the trap in the little rim with molasses or any other fluid that the moth is not capable of going over, to keep him from descending the tree. When I prevent him from going over my tree he goes back to seek for a hiding place and crawls through those little holes in the side of the trap, and goes on to the body of the tree where he secretes himself, and when he hatches out he is larger than he was at first, and he cannot get out. So I place my trap there in the Spring and I guarantee to catch every moth that goes over the tree. The trap having been examined by the various members of the Association, in response to inquiries, Mr. Thissell stated that Mr. Montague, a tinner of the town, told him that they could be supplied from ten to fifteen cents apiece.

MR. McDONALD: Having taken a trip recently through the Territories up as far as Boise City, and while traveling in a stage coach, I fell into a conversation with a passenger on the subject of the codlin moth, which gentleman informed me that he was enabled to keep his trees entirely free from it; and upon further inquiry stated that he took an ordinary nail keg, covered it over on the inside with coal

tar, then put a candle in the bottom of this, making a little hole in the bottom of the keg, and placed the barrels under his trees at night-fall, and the codlin moths would all gather in the barrel. He said he had caught them by the thousand, and after a long experience it had worked perfectly satisfactory.

MR. CADWELL stated that his orchard being partially affected by the codlin moth, he had appealed to Mr. Chapin, Mr. Cooke, and other fruit growers, and in order to rid himself of the pest he had placed bands around his trees. Upon removing them subsequently, he found they contained a large number of the moths, which he killed. Having satisfied himself that the moth flew in the night, and the larvæ probably crawled in the night, he came to San Francisco and bought a gross of fruit pickle jars that cost \$7 50 a gross, and put a bottle in every third tree in every fourth row. This bottle he partially filled with a mixture of one part syrup and two parts vinegar and five parts water, filling the bottles about one third full. It was quite a little time before he commenced to catch any moths, and then he caught a good many millers, and the curious part was that when they got to the liquid where the other moths were, they would not leave it though capable, but stayed there and died. With the miller, as soon as he escapes from his chrysalis, he immediately sought his mate, and as soon as he got in the bottle he would never try to get out.

MR. KELSEY: I found my orchard was very much infested with the codlin moth and despaired of ever catching them in any way, when I turned my hogs in and they ate pretty nearly all my fruit. My sons reported to me this season that the orchard is nearly free from the codlin moth. The fruit is fair and nice, and they have not injured the crop scarcely any.

A dispatch received from Los Angeles with regard to the codlin moth was here read to the Convention by the Secretary:

LOS ANGELES, November 21, 1883.

To the Fruit-Growers' Convention, now in session:

MR. PRESIDENT AND GENTLEMEN: I hope you will be able to effect some good. If there were any law to prevent peddlers from peddling wormy apples all over the country it would be a good one. By the peddling process, and country people bringing wormy fruit into Los Angeles, I feel assured the apple and pear crop will be entirely destroyed in two or three years. Sorry that I cannot be with you.

Yours most obediently,

S. McKINLEY.

MR. HATCH: In attempting to destroy the codlin moth I found a very good remedy for slug on the pear. In spraying my trees the spray of some destroyed the old eggs of the slug as well as the slugs themselves; whereas, in using dust and throwing it over the tree, as I used formerly, I only destroyed such slugs as had become fully matured and had come out of the egg, and had done some damage at the time of finding them, whereas, the spray seemed to kill them in the egg and save all the damage.

MR. McMULLIN: I have suffered from codlin moth for five or six years, and have tried various ways to exterminate them, but never successfully till this season. I used cans and pans. I have tried pails one month with a preparation of syrup, vinegar, and water, and went right at it. I took an oyster can and put a little syrup and set it in the tree, and the first night I caught five. I think I had two, and hunted up all the cans and pails I could get, and commenced

filling them, and when I used up what vinegar I had, I tried sweetened water, and I could catch them in every vessel; I could not see any difference. While filling up my cans from the buckets, I had some water left over in my bucket, and I hung my bucket in the tree about two thirds full, and the next morning I went down with my son, and in the tin cup there were forty-two codlin moths, and in the bucket in which there was about a gallon of water, there were so many that we didn't pretend to count them. I immediately made a contract for one hundred tins at three cents apiece, and sent to the city for a barrel of black molasses to make sweetened water to put in cans, and I would catch overnight from ten to twenty-five in a tin cup. I kept it up and went and ordered another hundred cans, and I was successful in catching them until I gathered in our fruit, and they commenced diminishing. I am firmly convinced that by using the pans and cans we can catch and kill them all.

MR. VESTAL: I had an apple and pear orchard. Some two years ago the codlin moth infested it, and for two years I fought them with pans and everything I could think of or find out anything about, and I finally hit upon a plan that was a perfect success. I simply dug a hole, two feet deep and five feet across, and burned all the roots near the top of the ground, and all the tops of the apple and pear trees. I have abandoned the codlin moth; and all you gentlemen who want to fight him can do so. I am willing to submit, that in one respect he was master, and in another, I was.

MR. — stated that glass jars were better than tins. He had had his trees scraped perfectly smooth, and washed them with strong washes, and used every pains, and that he was so successful that he offered five dollars for a single codlin moth, and all that Winter never could find one on the bark of the tree; but the next Summer they had codlin moths in abundance, and he would like to know what became of them.

MR. COOKE: They may be in the ground, and possibly six inches below the ground; but some gentlemen who have had experience stated that they could pick two or three quarts of codlin moths with a knife point from the crevices and rough portions of the tree. I think Mr. Hatch has been tolerably successful. If you get the spray on the young fruit, while it is free, the moth certainly will not lay its eggs. That has been proved beyond a doubt, and a spray costs about four cents a tree. You can spray about four thousand trees well over for \$160; but, unless you want to poison the people who use your fruit, do not think of Paris green. A gentleman from the East says they use Paris green there. They can use Paris green in the East for certain things, but if you use it here you are liable to poison the people who eat your fruit. I believe that the codlin moth can be exterminated, to a great extent, by intelligent work done in an orchard, and that intelligent work will pay you, and for every hundred dollars you have so expended you will get in four; but there is a great deal of work to do, and unless properly done, a man may as well do nothing at all.

Five years ago I worked a whole Summer with sugar and water and vinegar, and was not very successful with codlin moths. I caught plenty of other moths, and I believe in setting out the pans, because you kill a great many moths. A gentleman came into my office last Summer, and said that he would catch three hundred moths in a night, and all codlin moths. I asked him how long they were, and

he said an inch and a half long. I showed him a codlin moth, and he said, "I am not catching that thing at all." There are a great many moths similar to the codlin moth. I have no doubt that cans are successful catchers, and I say, with Mr. DeLong, if you catch twenty you are doing good work, but do not give up the other remedies. The cocoon of the codlin moth is made of silk, and, of course, could not be penetrated by ordinary washes. The intention in washing the tree after scraping is merely to create new bark, and to kill any larvæ left on the tree, but the principal thing is to give it a nice smooth bark. The only thing that I have ever found that would penetrate the chrysalis was to take lime and spread it with coal oil and mix it with water, and that will kill the worm about every time. I know it has cost Mr. DeLong a great deal of money to raise good apples, and he would not sell any but good apples.

One gentleman speaks of turning in hogs in his orchard, and another one hired some Chinamen to pull off the fruit and feed the hogs, and in that way he destroyed a great many moths and their larvæ, and the next year he had a good crop; but I advise all fruit growers against the use of Paris green.

SENATOR JOHNSTON said, that in his opinion, the mature codlin moth left the fruit before it dropped.

MR. COOKE thought not after the first crop. Upon inquiry as to how many crops of the codlin moth there were, he replied that in 1881 we had had four crops, but that ordinarily we have three crops every year.

After some discussion, on motion of Senator Johnston, it was decided that this Convention terminate its labors to morrow (Thursday) evening. After this motion a recess was taken until half-past seven o'clock P. M.

Evening Session.

At half-past seven o'clock P. M. the Convention reassembled, the Hon. L. W. Buck presiding. The general discussion upon fruit pests was resumed. The special subject of the evening's discussion being announced as the San José scale.

THE CHAIRMAN: I am either fortunate or unfortunate in having planted two years ago the coming Winter a number of pear trees. I purchased them in San José, and supposed at the time that they were entirely free from the insect; at any rate they were all disinfected before they were shipped from there, and for the first year I did not discern a live scale, I think, but I have within a short time seen more or less live scales on them. These are young trees, and as I have about five thousand of them, I would like to hear from some one who has had experience as to the proper steps to take to mitigate or destroy the pests.

MR. HAINES was sorry to find that any one had experienced trouble with fruit trees imported from his section of the country. Coming from San José myself I dislike very much to note the expression of any dissatisfaction with Santa Clara County, but, nevertheless, scales are on the decline with me. I having resided a great ways out, set my trees out previous to the advent of scales in nurseries. Last year I discovered on the peach trees, as I was pruning them one day, the scale very badly indeed. It was a small lot of trees, and I washed to get rid of them. Next morning I took a strong solution of concentrated lye and washed the infected buds; in about a week or two

more I washed them again, and then I grafted them. I found the scale also on the almond trees. If I had the orchard which you had, I would use the ordinary remedies, but I would use them a little weaker than perhaps prescribed, and apply them a little oftener, and you will kill nearly all. You must watch them very closely, and where you see the scale beginning, I should watch that orchard for a number of years, and if scales begin in any locality you should wash the trees to get rid of them. It costs us a great deal of money to destroy these insects, besides loss of an immense deal of money from injured or destroyed fruit.

Mr. Haines especially recommended the application of caustic soda for the cure of the scale, saying that it had the effect of not only killing the insects, but of thoroughly cleansing the tree from moss. The proper solution was about one pound of caustic soda to one and one half gallons of water. In his experience, the mixture of concentrated lye, each pound to a gallon of water, or sometimes even in weaker solutions, had been successful. He had used the soda with very beneficial results, and to his own great satisfaction.

Mr. ESTEE: Mr. President, I am here to listen and take note of the thoughts of others, rather than to discuss a subject amongst gentlemen who are so conversant with it as those I see around me. I do not know that I can tell you anything which you don't already know upon the subject of horticulture. I have been very much interested, during the short time that business has permitted my presence, with the proceedings of the Convention, and I listened with a great deal of interest to the gentleman who last spoke relative to this San José scale bug. My personal experience has been that I have had several hundred pear trees, about four years old, which I purchased in San José, and I think all of them were affected by the scale. At first I did not know what to do, and I inquired of Mr. Cooke, of Sacramento, and in accordance with his recommendation I used a wash of caustic soda, and the next year there were still some scales left, and I tried the caustic soda again. Last year I applied lye, and I believe it is the best remedy that can be used for the scale. It certainly kills them and does the tree good. It cleanses the tree of moss and any foreign substances. In our county, that is, Napa, I think it is applied about a gallon of water to about a pound of concentrated lye, and I applied this liquid to the trees. Under its treatment it certainly killed every insect with which it came in contact, and, as I said, seemed to remove all moss and foreign substances from the bark. I am very glad to have been privileged to listen to what the distinguished gentlemen here present have said on the subject of horticulture. I was struck yesterday when Mr. Davis and one or two others spoke of horticulture in this State, and astonished with the uniformity with which prominent men viewed the subject, regarding it as one of the leading industries of the State, and one probably destined to be foremost.

My own orchard is somewhat limited. I have devoted but thirty or forty acres to fruit culture, although I have a very large vineyard, and viticulture I feel somewhat interested in, because my interests are so much larger in that respect; but I must admit, that this year my orchard paid better than my vineyard. We had a very light crop of grapes in our section, and a very good crop of fruit. In Napa County there are some fruits that we don't raise successfully. I don't think that county is good for apricots, and a number of other

fruits which you raise elsewhere. In Napa County we raise certain fruits very well. In our orchards we raise very good pears and apples. I had a very good crop of apples this year, and some very fine pears. Last year three fourths of my crop was destroyed by the codlin moth; this year, about one eighth. I waged a determined and vigorous war against it. Last year it got away with us; this year we get away with it. We put sacks around the trees, and visited the trees as often as every week, and removed the bands and killed the moths, and we put cups of sweet water and vinegar and other stuff in the trees to catch them, and whenever an apple was noticed to have a moth in it, it was immediately boiled and thrown to the hogs. You know that most always insects get in the grass or weeds under foot, and I believe in running the hogs in the orchard if you can. I think it is a very great benefit, though all I know of it is what I have seen myself this year. I permitted my hogs to run in my orchard and to eat the fruit which dropped, and threw to them all fruit which seemed to be affected, and I lost very little fruit through the moth.

I would say further, I was struck yesterday when I was in here with the report of the committee on organization amongst fruit growers, and the general discussion which ensued in regard to the necessity of united action in behalf of their common interests. By the institution of such an organization, and by mutual assistance, you will sell your crop for what it is worth. I see that such a measure has been inaugurated in the East, in New Jersey and other places, with great benefit to the fruit growers. It is of the utmost importance to a fruit grower to know how large crops or small will be raised in the different parts of the State.

MR. HAINES again spoke on the subject of the application of caustic soda for the scale as destroying the insects. He spoke of trees, eighty-eight or ninety per cent of which had been badly infested by the scale, which had been thoroughly cleansed by the application of soda. One pound of lye to one gallon of water would probably be about the right strength with which to make the application. It might require several applications to destroy them all. Because a person makes an application of caustic soda on trees very badly infested, and does not immediately succeed in killing all the scales, the remedy should not be dropped, for a second or a third application would probably be successful. An equally good wash can be made with concentrated lye, for which you pay six cents a pound, as with that for which you pay nine and one half cents.

DR. CHAPIN: I should differ with the views expressed in regard to the use of cheap brands of concentrated lye. I have noted most carefully the results and effect of the wash itself on the insect, and I know positively that good lye in the strength proposed, does fully penetrate the scale and kill the insect underneath it, and the insect is destroyed in one day's time, so that in a very few days after the tree becomes dry the scale will begin to drop off from the tree and the tree gradually becomes clean by the action of the rain and the wind, and remains so. It is almost impossible to deal with trees that are situated near together. The application recommended by Mr. Cooke, for Summer washing, would destroy a great many insects and would hold them in check so that they would not spread to other trees.

The speaker continuing, spoke of the great number of brands of lye advertised in the market, many of which were perfectly worth-

less, and orchardists having applied them became despondent with regard to cleaning their trees, therefore he recommended orchardists to be careful in getting a good quality of lye to use as a wash.

MR. MATTHEW COOKE suggested to the members that it would be a good idea for them to save and take care of all the wood ashes which they could procure; that by being a little careful in this respect they saved themselves many dollars in the course of the year, as from the wood ashes a very good lye could be made as a wash for their trees, and each year the cost of making such preparations was becoming a severer tax upon the orchardists, and as he thought, needlessly, as in the neighborhood of every orchard, large quantities of wood ashes were yearly wasted which could be had for the mere gathering. From wood ashes excellent lye could be leached out.

In response to a question as to the proper consistency of the lye wash to be applied to the trees, Mr. Cooke said that the strength of the lye, or whatever material used, should be of sufficient density to float an egg. By taking a pound of lye and dissolving it in water, it would be just about the proper consistency. Many prefer the caustic soda, or the lye, according to the kind of fruit tree upon which they wished to use it.

On motion of MR. W. M. WILLIAMS of Fresno, it was ordered that the report of Dr. S. F. Chapin, Inspector of Fruit Pests, on the condition of the orchards of the State, be accepted and printed with the proceedings of the Convention.

MR. WILLIAMS: I would like to say something to the members from my experience. I would caution them against dipping young trees into troughs of lye. In one instance that I know of, two thousand young trees were dipped in a solution of American lye of the strength of a pound of lye to a gallon of water, and nearly all were killed. The lye of the same strength applied to the growing tree, by means of the spray, would not have injured the tree at all. They killed the scale, of course, but also killed nearly all the trees; among the trees were apricots, pears, and peaches.

MR. ESTEE: I wish to state that I tried it last Winter also. If you wish to kill the tree, all you have to do is to dip it into the lye. You may take exactly the same strength, a gallon of water to a pound of American lye, which you could safely spray over growing trees, and if you dipped a young tree in that the odds are ten to one you will kill your tree, while as I say out in the open air applied by means of spray it don't kill the tree.

To the suggestion that, perhaps, the speaker had dipped the roots of the tree into the lye, Mr. Williams stated that the roots were not washed.

The paper of MR. WILLIAMSON, on the subject of figs, having been called for, Mr. Williamson apologized to the Convention for not being prepared with a paper, and said the fig question is a very great one. It is well known to the merchants of the country and to the people at large that there is a vast amount of dried figs imported from foreign countries into the United States annually. The amount runs up in the millions. I have tried recently to ascertain some approximate estimate of the amount in dollars and cents of dried figs imported into the United States per annum. It would probably average two million dollars now per annum, and I think that I may say that no other country on the globe can produce a better fig than California, especially in certain localities along our foothills where the climate is warm. The

soil of the Sierra Nevada foothills seems to be peculiarly adapted to the growth of the fig. About Newcastle, for instance, at an altitude of from six hundred to twelve hundred feet, the fig tree will grow luxuriantly. It will grow and do wonderfully well without any watering whatever. The common California black fig, which will grow almost anywhere in the State, can be made very profitable. It is true there are certain localities in the State in which the fig cannot be grown very successfully, but this California black fig can be grown almost anywhere, and although it is not the best fig yet it can be made very profitable. I should state, however, at the start, that there is no fruit that is more nutritious than the fig, except, perhaps, the olive. There is no fruit that comes so near taking the place of meat and bread, and that will sustain life longer than the fig—in other words, which possesses more nutrition than the fig—except, perhaps, the olive. There is no fruit that we cultivate, or eat, that possesses more medicinal properties, and that is actually healthier than the fig, excepting, perhaps, the olive. There is no fruit, when you become accustomed to it, more delicious than the fig, with the same exception. Now, in view of all these facts: that it is very nutritious, very delicious, and possesses medicinal properties, why not cultivate it and use it in our families more extensively? Again, it can, in my judgment, be made one of the most profitable fruits that we grow. The tree will grow with less care than almost any other tree. It will grow readily from cuttings, but curious to state, it will not bear transplanting, and it seems to be very singular that it is so when it will grow from cuttings, but after once rooted when you attempt to transplant it it is really hard to do so.

Now, as I said awhile ago, an enormous amount of money goes annually from the United States into foreign countries for this product, which money we might just as well keep at home as not; and as before remarked, it is not only a good tree to grow, but it needs no cutting back, except simply to give it shape. I think perhaps insects prey on it less than on almost any fruit tree we can cultivate; the tree itself requires less care than most any other tree we can cultivate. The fruit, when we once understand how to gather it, is easily handled and gathered; if you don't, it is very hard, but if you do, it is the easiest fruit to gather that there is. To handle it properly you want the ground clean underneath, and then cover the earth with straw, or else have as clean a surface as you can get, and let the figs hang on the tree until they will drop off or come off easily by shaking the tree; then they are pretty near dry enough to pick. Most people commit the error of drying their figs too much. They want to be dried very little, and should be still soft when you pack them away. It is more than half dry when it falls off the tree. You should go around and gather them up every morning, or once or twice a day, and spread them out and dry them, then they are ready to pack away, and they will keep.

Now as to the profit of the fig culture. I know of trees that are fifteen and twenty years old, from which gentlemen who own them tell me they gather from three to six hundred pounds per annum from a single tree. The common black figs are now bringing from five to seven cents a pound in our market. As there is a taste being cultivated for them, I anticipate that there will be a fig boom coming on. Notwithstanding there are more figs thrown on the market now than there were a few years ago, they are bringing a better price;

they are bringing this year from five to eight cents a pound, in sacks, and if properly handled and cared for, might bring even more.

Estimating one hundred trees to the acre, we will say three hundred pounds of dried figs to the tree, though at six cents a pound, with less handling than it takes to handle and care for any other fruit, gives \$18 to the tree, or \$1,800 to the acre. Now is there anything else that you can cultivate that will yield you a better return than this? If you can get the finer varieties, and the genuine Smyrna figs, of which a great many have been imported within the past year, fortunes can be made. We will all have the genuine Smyrna, I am inclined to think, more than we have had yet. The genuine Smyrna fig is worth in New York to-day, in packages, a high price. They grade them in first, second, and third grades. They are worth now in Chicago or New York, where the importers sell them in large quantities, in hogsheads from eight to sixteen cents per pound, so there is a strong probability that ere many years we will be able to realize fully as much money for the California figs as we pay now for the imported fig. Then, as we can realize, as I think we will, eight cents a pound for our figs, we can readily see what an enormous profit there will be. As to the varieties, we have a number in this State, and at the present time the large black fig, commonly called the Mission or Spanish fig, does the best, but there are some other varieties which we are experimenting with that we think will far eclipse them in time. But there are no considerable quantities of those varieties and I am not very well satisfied that they are just the fig we want. I have tried to give you my ideas in brief, that the fig is a very healthy and nutritious fruit, easily handled and cared for, little infested by insects, and a profitable fruit to the orchardist.

MR. HIXSON: The fig question is one which I have devoted a great deal of time to the study of, and I was in hopes that Mr. Williamson was going to say something that would make me enthused on the question, but he did not state it as strongly as he might, I think, from my observations and experience in the matter. Some two years ago, when I went on East, I was carrying some products of California with me, and among the rest I took some very fine dried black figs from my place. A gentleman of San José put them in one of Coats' thread boxes, and made them look as nice and smooth as possible, and in talking with a gentleman there, I would tell him that if he had ever seen anything of our California fruits he would take a good deal of stock in our country, and amongst others, I showed these figs to a gentleman in New York who is the largest importer of figs there, and looking at the box, he picked up these figs and says, "Whenever you Californians can produce a fig that can come up to the Smyrna fig, you have struck the greatest bonanza you have ever struck in the fruit business;" and also says, "that is nearer a Smyrna fig than anything we have ever seen from California." Well, that was very satisfactory. This last season we had a sample of a hundred pounds put up in little drums that weighed not quite three and three quarter pounds; we generally call them four-pound drums. A man came in and wanted to know what they were worth, and I told him twenty cents per pound. He was struck with astonishment. He said he had never seen anything so good, and he thought my lot as well raised and the price as cheap as anything he had ever seen. The importers of the foreign fig could not stand it, and finally one fellow said, "I will give you six bits a drum for them, and make them a

present to my customers." There were twenty-four drums, and we thought that was about as good an advertisement for our business as any we could have. On the next lot of figs, I raised the price to eighty cents, and I think you will have no trouble in getting twenty cents a pound for such a product. Mr. Williamson estimates the price at only eight cents. I tell you they will bring from fifteen to twenty cents a pound, if you only put them up right. Mr. Williamson, I don't think has given the fig interest credit enough. There is a gentleman down at Riverside who planted a fig orchard and persisted in its cultivation when all of his neighbors had abandoned them. They all gave them up, except Mr. Burnham, and now he has a fine orchard of this fruit, which he has no trouble in disposing of at twenty cents a pound, well put up. His figs are of the white Ischia variety. You can get up a great deal of enthusiasm, if you will prepare your figs in drums, and send them down and sell them for eighteen and twenty cents a pound. I think there is no doubt there will be a boom in the fig market in the near future.

DR. CHAPIN: While not wishing to dampen the enthusiasm which might prevail in fig growing, and while fig trees will, in many instances, yield immense crops (in some cases I have known the yield being nearly a ton of fresh figs), yet I would call attention to the fact that the fig will not succeed everywhere. It is in but comparatively few localities that it will be profitable. In many regions it will not mature its fruit properly, and in some regions not at all. There are, however, enough locations where it does succeed admirably, and where it can be made very profitable. In this, as in the case with other fruits, you should be sure to plant in the right places.

Here, after further discussion upon this interesting subject, the Convention adjourned until to-morrow morning at ten o'clock.

THURSDAY, November 22, 1883.

The Convention met pursuant to adjournment. The President, E. J. Wickson, in the chair. The Convention took up the order of miscellaneous business.

MR. HAINES: In view of the fact that this is the last day of our session, and it is necessary for us to begin to prepare for our next annual session, and as each meeting discloses to us the failings of the last, I have prepared and will introduce a resolution here which I think will provide for some wants which we have all generally felt, looking towards the coöperation of the various members during the coming year in preparing for the success of our next Convention:

WHEREAS, As anything which tends to enhance the interest taken in future Horticultural Conventions should be encouraged; therefore, be it

Resolved, That each member of any future Convention that shall be held by the horticulturists of this State should supply such things for the inspection and information of such Convention as would be of interest to it; therefore, be it further

Resolved, That we invite any parties whomsoever to procure for the inspection of such Convention, any article manufactured and intended for horticultural purposes, or anything in any way connected with horticultural pursuits. And be it further

Resolved, That a suitable room should be provided in close proximity to the assembly hall of any such Convention for the purpose of exhibiting any articles thus offered for inspection. And be it further

Resolved, That the evening of each day of the session of the Convention shall be set apart for the inspection in the exhibition hall.

After some discussion and amendments by PROFESSOR DWINELLE, the resolution, providing that during future Conventions an exhibition be held containing specimens of orchardists' work and machinery, not to be open during sittings, was passed.

DR. CHAPIN said that that suggestion was a very useful one indeed; that it had been attempted to be carried out at San José last year at the Convention then held there, so far as, under the circumstances, they could do. At these Conventions, in which fruit growers from all parts of the State participated, the best opportunity was presented for interchange of ideas on all subjects.

A. T. HATCH, Chairman of the Committee on Fruit Statistics, here presented a report recommending the formation of a State Association of Fruit Growers, as the best means of protecting their interests and obtaining reliable information as to the condition and value of the fruit crops, which paper was read as follows:

SAN FRANCISCO, CALIFORNIA, November 22, 1883.

To the Fruit-Growers' Convention :

Your Committee on Statistics and Ways and Means beg leave to report, that after careful consideration of all matters referred to the committee, it is of the opinion that the best way to obtain reliable information as to the condition and value of the fruit crop is for the fruit growers to organize a State association for that purpose. A temporary form of association is herewith submitted, which the committee ask this Convention to adopt and recommend to fruit growers.

A. T. HATCH, Chairman.

We, the undersigned fruit growers, associate ourselves under the name of "The Fruit Growers' Association of California," for the purpose of obtaining reliable information as to the condition and value of the fruit crops in this State and other countries, and we hereby appoint A. T. Hatch, William Johnston, L. W. Buck, W. H. Aiken, F. C. De Long, A. Block, and W. H. Jessup, as a State Executive Committee, with full power to act in carrying out the objects of the association, and preparing rules and regulations for its government, to serve until its successors are elected at the annual meeting to be held at 40 California street, San Francisco, at 1 P. M., on the first Tuesday, the fourth of March, 1884, when the Association will adopt rules and regulations and elect its officers for the ensuing year.

We promise to pay a membership fee of ten dollars to the order of the Chairman of the State Executive Committee, on or before the first Tuesday in March, 1884.

MR. DE LONG: The article as drawn up might be circulated among the members here for signature, and they will have an opportunity to talk it over. It has been talked over in committee, and we have suggested the names of such members as we thought best to carry it out; but we would like to have the sympathies of the entire Convention in our labors.

MR. JOHNSTON: By the permission of the committee, I will say a word or two in connection with this report of the committee. As I understood from some of the members who conversed with me on the streets, and explained to me the groundwork of their plan, this, practically, will be a close corporation, so far as the intelligence or information to be generally circulated is concerned. No information will be given to any but members of the association. Unless the information thus gathered were given out only to members, there would be no use or inducement for members to pay dues and belong to such an association.

MR. HATCH: That was the intention, and we have considered it in many ways. We thought there would be nothing wrong in conducting it on business principles, and gathering and circulating among our own members fruit statistics, and allowing them to have the full benefit of the information, and we propose to transmit this information only to such as are members of the society.

MR. BLACKWOOD: On this matter I did not vote one way or the other, but under the explanation I have received from Mr. Johnston, and Mr. Hatch, I think it is really a close corporation, and as such I do not propose to have anything to do with it. All the information that the fruit men of California require is such general information as will enable them, in various fruit districts, to know the amount of fruit that probably will be raised—a probable estimate of the amount of fruit that is to be produced from the ground in every other district in the State. I do not like the idea of a close corporation, and I think a much better plan would be to organize auxiliary societies throughout the State in districts, and let them transmit local information to a central organization.

MR. BLOCK: My views are at variance with those of the gentleman who has preceded me. The first point is to gather information, and as the cannery, and others depending on the fruit industry, have close corporations of this kind, I can see no objection to our organizing such an one. Two years ago the cannery formed their close corporation and fixed prices as to what they would pay for their fruit. They informed us that there would be an immense crop. Then the fruit was in bloom. The general information was circulated in almost every paper that you could pick up that this would be the largest fruit crop ever grown in California. The result was that many fruit growers throughout the State sold their crops at very small prices upon false information. The peach crop, for instance, we were informed, in the East would be immense; in reality it was a failure. It was the smallest peach crop ever raised. If there is a small supply of currants, for instance, the basis of the jelly is made by the cannery with apples, so we are interested in that way, even in knowing whether there will be a short supply of fruits which we do not particularly raise. We do not want to deceive others, but we do not want to deceive ourselves. We do not intend to circulate reports that are false, but we wish to have accurate information transmitted amongst the members, and if there is any way in which it can be distributed gratis, I am in favor of it.

What do the cannery do now? Early in the season they send around and gather information from place to place, and from personal observation, then they make their price. If they find the crop is going to be small, they do not publish to you that it is going to be a small crop; on the contrary, if they find there is a failure of any particular crop, they will come to you and represent what a large crop there is, and endeavor to buy you cheaply. The point is, that we should not go without information, as we have been doing for so many years. The buyers go from section to section and ascertain, throughout the State, what the fruit crop will be. This is an expense to them, and they are not going to give you information of the cost. They offer you ten per cent more for your fruit than they did last year. It does not prove that you are getting its value; if you knew the facts, possibly you would not sell for twenty-five per cent more.

MR. L. W. BUCK said that the report of the committee amounted to nothing. They were simply offering suggestions as to a starting point for an organization in this State, which could be molded hereafter, as necessity required it, to suit the views of the majority. He believed that the ideas suggested would be of more benefit to fruit growers than anything that had been so far suggested. If there was to be a profit made upon the fruit, the fruit grower was entitled to it,

and, while he was not in favor of a close corporation, he believed that those who were willing to pay for it were entitled to receive the benefit of it. But so far the action of the committee had been to formulate a principle which could be hereafter elaborated. He would be glad to see as many fruit growers of the State as possible sign the resolution, and come forward and meet with the committee, and adopt such by-laws as were appropriate. From this time on we then would have something that was tangible, some organization from which a fruit grower could obtain information that would be reliable, because the idea was to give it the power to incur necessary expenses to ascertain the size of the coming crop; by the time the organization was started practically, some other views might be decided upon. As to whether it would be a close corporation or not would depend entirely on those who signed and paid their ten dollars and became members of the association.

MR. JOHNSTON stated that his object had been accomplished by bringing the matter before the Convention, as, even if nothing were now done, the matter had come up and had been discussed, and the information would be disseminated throughout the State amongst fruit growers, and, besides, action could be taken at any time. It appeared to him that the Convention was entering upon the most important work which it had to do now, the permanent organization, for all future time, of the fruit-growing interests of the State. But, it seemed to him that the whole matter might be accomplished in some other manner as fully and effectually as in the proposed plan. The fruit interest was becoming one of the main stays of the State. At the present time there appeared to be a fruit mania, almost everybody were coming to be fruit raisers, even the grain growers, and those engaged in other agricultural pursuits, were planting more or less fruit in connection with it.

MR. G. W. FRASER: There is an organization already in existence through which, it looks to me, all objects here desired might be carried out without additional expense. The farmer has already too many separate organizations entailing too much expense upon him. Mr. Fraser then referred to the Grange organizations, which already, he said, covered the agricultural interests, with which the fruit interests could very well be harmonized.

MR. HATCH: It has been proven that those engaging in one business do not, as a rule, coöperate with those in another. Lumber dealers do not coöperate with the men they employ to cut their logs and haul them to mill, or those who plant trees for the purpose of making timber from them, but every business has its own organization and looks forward to its own success. Innovations are growing every year, and fruit growers should coöperate with each other in this business, and not handle their favored occupation with those interested in agricultural pursuits. The idea of conducting it through a Grange I do not think is practicable in this case.

MR. DE LONG: Of course we will feel a mutual interest in one another, and are willing to exchange views, and are thoroughly resolved that if anything happens to our crop we will make it known to somebody. Now, who will the person be? It must be somebody who stops in the city or in a central place to receive communications and ideas and exchange ideas with others. Such a person has got to be paid for the business. Office rent, clerk hire, and other incidental expenses will arise. There are a great many large and a good many

small orchardists. The large ones certainly want to know something of the condition of the fruit throughout the State. The small ones, of course, cannot afford or will not care to do it. There is but one thing to do: to take the bull by the horns; go in and get up an association exactly as we are starting it. Because it never will be started except by this personal interest. It will be necessary for us to send men around to gather information and distribute it. I think any one who wants to know the news should stand in with us and help pay the expense. The amount is small in comparison with what we may gain or lose by having or not having the requisite information. Whatever is everybody's business is really nobody's business. If we trusted to everybody, we would get no information at all. It will be worth ten dollars to any one raising a particular crop if they know that such a line of fruit had failed in another section, and by having such an organization as we propose, information detrimental to us or in our favor will be surely and rapidly sent to us. A fee of ten dollars at the start is not an exorbitant one. We must establish a fund of not less than \$1,000 for a start. If sufficient members join, the amount can be easily reduced. I am not in favor of collecting a large amount of money, but I think we should have enough to insure our getting the organization under way, and then, from experience, we can determine how cheaply we can run it.

MR. AIKEN: The committee looked at this matter in all its lights and regarded it as a purely business transaction. We are not raising fruit for benevolent purposes, but to sell for money. We are selfish in the matter, so is every business man. You can call this a close corporation or a selfish corporation. We are establishing it because we want to sell our fruit for what our fruit is worth, and we want light on the subject, so that we can fix our prices somewhere near to what the fruit is worth, and not be entirely subject to the cannery and other dealers who fix our prices for us, for our labor and our fruit. As Mr. De Long says, this costs money. As it is not a benevolent association nor a social one, we expect to pay our money for information, and we pay to have what we suppose to be reliable information, and it is like anything else that we need and buy, we must pay for it. If I buy a horse the horse belongs to me; I do not buy him to lend around amongst my neighbors, and when I pay ten dollars to an association for information the information is my own to go upon. It is certainly worth that amount of money to any one who is largely engaged in raising fruit. Information on some occasions may be worth thousands of dollars. Sometimes one third of one per cent is a big profit. I sold some fruit at two and three quarter cents per pound. I might have got three cents if I had known certain things relating to it. In a large amount of fruit a quarter of a cent is an item. All these matters will be discussed next March when we again assemble, and I hope that every fruit raiser in the State will see that he can be benefited by joining the association, and it will become very popular and very beneficial.

MR. JESSUP: I do not apprehend that the expense of collecting this information is going to be so great as most of the members think, if the members of the Convention themselves would use their influence in establishing district organizations, through which better and more correct information could be obtained than through any hired help. That could be done without any expense in collecting statistical information, and each local organization could then send

to the central State organization such information, and receive from it in return, anything of interest. I think it would be very well for us who have influence on them here, to induce their friends to form these organizations, and they will soon show that they are interested in doing it. I do not believe in hired help in securing statistical information, and, even if we raised one or two thousand dollars to start our society, we could still do the other.

MR. HAINES humorously commented on the plans suggested by the various members, then suggested himself that the fruit growers should subscribe to a paper just as the Grangers do, who have their special organ which they support themselves. Suppose we had a paper, which we subscribed for, and which would publish this information gratis. The whole thing could be accomplished with little or no expense to us, and a paper might be a paying investment. The information would come from the fruit growers to the paper, and circulated by the paper throughout the State to all fruit growers, each and any of whom could write to the paper, asking for such general information as he desired, which would be answered by some member.

MR. DELONG, MR. LADD, and MR. HATCH discussed generally the newspaper proposition, expressing themselves as willing to subscribe for a number of copies to any such paper, which would circulate fruit news, and disseminate such general knowledge as to fruit as was desired.

MR. CHAPIN: I would like to make a suggestion upon the discussion of such information as could be gained through this Bureau, or through this Committee on Statistics. Fruit growers can be in a position through their own knowledge to say to the party who comes to buy their fruit, that they know what it is worth, and they can have the value fixed at such a price as may be favorable. The canner knowing that fact will be more fair in dealing with the fruit grower than he would otherwise be.

MR. HAINES: The question is, how can we reach the people? If every fruit grower pays \$10, look at the immense fortune that would be raised and spent. I believe through the instrumentality of the press it would be much more effectual, and much cheaper.

MR. BLACKWOOD: As I provoked a good deal of discussion in the first place from the gentlemen on the other side, I will state my position a little clearer. Of course, whatever information we get usually costs us money, but my objection is to forming a close corporation—a sort of farmers' exchange among fruit growers—a fruit-growers' exchange that will unite together and pay somebody to go around through the country and ascertain how much the crop will be, and that we keep that information to ourselves, and we will say to Cutting & Co. and to Lusk, and other canners, Well, gentlemen, you can have our fruit at such a price. Well, they will say we can get all we want at so and so. We know what you can get. I fall in with the idea of my friend Jessup, to form sub-organizations in the various localities. This idea would require but little money to carry out, and the community at large would be benefited by these organizations. The gentleman has said that no man can tell when fruit is in bloom what the crop would be. I agree with him; but an observant fruit man can tell, from year to year, generally, what the prospect would be for the succeeding. Now I predicted, a year ago, that there would be a light crop of fruit in California. Why? Because there was a

heavy crop the year before; because the trees required alternate years of rest.

Now, I predict for next year we will see one of the heaviest crops of fruit ever grown in the State of California. Why? The trees have rested this year, and barring accident, we will see one of the largest fruit crops that has ever been grown in the State. I predict that, but then we are subject to many accidents. Now the newspapers, possibly, are all very well. We have got to meet these canners, and I, for one, am not afraid of them. The sun shines every day in the year, and the sun is the best fruit drier that nature has provided us with, and if the canner will not pay me what I deem a fair price for my fruit, I can dry and prepare it for market myself. I am independent of the canners. I care nothing about them. If there was not one in the State I would not take a cent less for my fruit than I am doing now.

MR. BLOCK: I agree that we can prognosticate to a great extent when we will have a light crop, but I don't think any of you can tell when we will have a heavy crop. Two years ago we had a very light crop; as a natural result we ought to have had a heavy crop the succeeding year, but what was the result? A lighter crop than the year before. You cannot control the frost, or rain, or other accidents.

MR. BLACKWOOD: The north winds blasted your crop.

MR. BLOCK: Yes, sir; and this year we have had two days that have destroyed many apples and many plums, and a great deal of other fruits. Now there is another advantage. If we were informed early in the season, for instance, that our apricot crop will be the largest ever raised in the State, what will be the result? We will make our arrangements, some of us to dry in the sun, and others with driers, and we will have an opportunity to make our arrangements beforehand. If we want to wait, a good many do, until the last moment, to see if we cannot sell to the canners, and then rush all our fruit in together, we don't do well. I think it will be a mutual benefit. "Forewarned is forearmed." I think the expense of \$10 to some persons will be well laid out, or a hundred dollars or several hundreds. We should know the facts whether they are in our interest or against us.

After some further discussion, the report was adopted.

The Secretary here read a paper written by W. H. Jessup, of Haywards, upon the necessity of organizing Horticultural Societies in all the fruit districts of the State:

ORGANIZATION OF FRUIT-GROWERS' SOCIETIES.

[By W. H. JESSUP, Haywards.]

Mr. President and Gentlemen of the Convention:

I desire to call your attention to a matter of the greatest importance to the fruit growers of this State. A matter that, in my opinion, has greatly impeded the development and progress of horticulture in California. I allude to the organization of fruit-growers' associations in every fruit-raising district in the State, for the purpose of the collection and dissemination of all knowledge pertaining to fruit and fruit raising. The gathering of statistical information is of the utmost importance to all engaged in our favorite and growing indus-

try, and this is only to be obtained through a perfect coöperative organization. Every other profession, trade, or calling, throughout the whole length and breadth of the country, have their associations and protective organizations, and their meetings are always attended, and they take the deepest interest in every subject that affects their calling, and whenever a move is made on the outside which threatens their individual or collective interest, they fly to the defense. And how is it with the fruit growers? It looks to me like a scrub race of go-as-you-please. One of the most valuable industries of the State, and one that is destined in the near future to become the specialty of our beloved California, with every member going alone, groping aimlessly in the dark, seeming to forget that in union there is strength.

Almost every State in the Union claiming any pretense to horticulture have their well matured organized societies, and do not think their time lost in giving a day or two now and then to their meetings, nor do they hesitate to spend their money as well as their time to foster and protect their highly prized industry, while we, in the great fruit-producing State of California, with her unparalleled yield and product, that has elicited the admiration and astonishment of the world, with a trade that is truly enormous in its proportions, are without a perfect coöperative organization. Some may say that if we have done all this without an organized concerted action, where is the need of organizing, and ask, are we not doing well enough without? Yes; we may have done well enough and may still be doing well enough, but can we expect to continue as successfully without a perfect organization? With the enormous increase of yield in the near future, can we thus protect and guard our valuable and growing industry intelligently. Then, again, could we not have done better if we had been thoroughly organized.

Then the question may be asked, who created and built up this enormous trade? Was it the fruit raisers or was it the merchants, canners, and shippers? It is true we produced and furnished the fruit, but then could we not have done better and made more if we had been well posted on what we were doing ourselves? The fact is, we know less about the prospects and yield of fruit and the condition of the market, capacity of the canneries, and the amount required for shipment, than the canners and buyers do, and possibly as little about the acreage planted.

As matters now stand we are at the mercy of the fruit buyers and canners. We have no means of obtaining statistical information as to the condition or probable yield of an incoming crop, the acreage planted, nor the proportion of the different varieties, all of which is essentially necessary for us to know, and which we can never know without some concert of action.

What we need is a well-planned system of associations in every fruit district in the State, with a central organization, such as the State Horticultural Society or the State Board of Horticulture, to which all information relative to fruit and orchards could be forwarded and made a matter of record, and such information as would be deemed proper, be published from time to time. By some such system as this, parties engaged in fruit raising could at all times obtain the information sought after, and avoid the loss of time and postage in writing long letters of inquiry to individuals to get in return a longer reply, or sending long communications to the press

to be published with the answer, taking up hundreds of columns of valuable space; all sorts of questions asked and answered, only to be thrown away or mislaid and forgotten in a day. It is strange how quick such information is generally forgotten—questions that are asked and answered in almost every horticultural meeting and every issue of our horticultural publications.

Yesterday I heard a member of this Convention express a regret that the writer had not been more explicit, in a paper just read, in naming varieties, and giving the distances that trees should be planted apart. Now, all those questions have been answered hundreds of times, but usually by letters or papers that are destroyed or mislaid, and their contents forgotten. Now, if such a system as I have sketched could be perfected, the Secretary could be instructed to compile and publish in pamphlet form, at stated periods, all desired information applicable to our climate and peculiar conditions, the best varieties to plant in each locality, and all desirable statistical information. Only in this way can we ever hope to intelligently handle an industry of the mammoth proportions to which our fruit crops will reach in the near future.

I am aware that a great many entertain the belief that the canners and fruit buyers would soon possess themselves of this knowledge, and have the fruit grower in their power, but with all due deference to their opinions, I must say that such a proposition is absurd and foolish. Is the farmer afraid to let the wheat buyer know the probable yield or condition of the wheat crop; the stock raiser afraid that the butcher shall know the number of cattle or sheep in the country?

I care not who knows the condition or quantity of fruit in the country. It gives them no advantage over me, if I but know it, and know what to do with it. We want to know the requirements of the market, the capacity of the canneries, then we know what to dry, feed to the hogs, or let rot, and, far as I am concerned, I do not fear to take a hand at orchard canning with the Wheeler patent cannery, which I know to be a success if properly handled.

And I do hope that every member of this Convention will exert himself, in his respective locality, to stimulate his neighbors to an energetic action in the organization of associations. If they lay back much longer, I think I can see them, in imagination, bewailing the decay of our once promising fruit industry.

The Chairman here announced, as the subject of discussion, "Stocks for Fruit Trees."

MR. AIKEN said: This is a very important subject to those who have not already planted as extensively as they desire, and those buying trees would like an expression of opinion upon the stock to buy; and although I have not very fixed ideas on the subject, although I have bought a good many, I would say, it seems the idea to bud the plum and prune on almond root. I suppose on the theory that the almond root is long lived, will grow on almost any soil, even a barren soil upon rocky hillsides, and is a very thrifty, strong-growing root. It affords a good deal of sap, and I have found, matures the fruit well. I have had some experience. One time I budded two or three hundred almond trees to the egg plum and the peach. I found the almond would stay on without holding them on myself, and they have all borne, and have certainly made a very good growth. The

egg plums this year, I believe, have grown something like six feet, and are forming very fine trees, and I am very agreeably surprised. Then, again, being a longer lived root than the peach it is preferable to the peach, and does not sucker, of course, and is preferable to the plum root. However, most all the prunes, and I think plums, in the State, are on plum roots, and many have trouble with suckers. I think that occurs very largely on account of deep plowing and cutting the root, and it throws up its little branches, and in that way is troublesome and expensive. I have not found it so on my place, but I know those who have. It is strange to say, that if you clear your place of suckers, in a few weeks you see them start right up again; but after all, they seem to do well on the plums and prunes, and it may be that we can better afford to sucker our trees and raise our fruit on a young live tree. I would be pleased to hear others talk on the subject.

MR. HAINES: The plum root in our county is a very unpopular root to grow fruit upon. There may be some kinds that are good, but we have not discovered them. If you irrigate your land, and it is fine and fertile, the suckers will spring up.

I have seen, in passing along the road in San José, the suckers so thick on each side of the tree that they resembled a hay field; and, sir, the only way to get rid of them is to dig them out. I believe the best way is to dig down and take the plum roots out so far down that they won't sucker up again. I planted some French prune trees, and the nurseryman made a mistake in setting them out, and in the afternoon he came back with the other trees. The proposition was made to me that they would take up the trees if I desired it, but I thought they were only small trees and in a little while would be as large as the others. Well, sir, those small trees have always borne very well, but the top is only one half the capacity of those that are upon almond and peach roots. As far as a strong root is concerned, last Winter we had a very heavy wind and nearly every one that were upon plum roots blew over, while those on almond roots hardly blew over; yet hardly one that was on plum roots but had to be propped up. Two years ago I planted some egg plums, and they have made but very little progress, while peach stock made an abundant growth. The top is heavy and thick, and the scions were long; while the egg plums have made little growth and look like a dwarfed two-year-old, although they are three years old and are under equally good conditions.

MR. WILLIAMS: I think it is rather bad for us that we have not had an exhaustive paper on this subject of stocks, because it is one of the most important in planting trees, and the craze seems to be a very fashionable one. We start in with our trees and raise them on the ground. For instance, with the almond roots we should be very careful in planting out future trees and making our selections. Now the almond does well on some soils. On others it is an entire failure; so with the plum. On a light live soil the plum is a failure. On your close tenacious soil it is a success; and we should look to that in the selection, and not make an indiscriminate selection of the trees all on plum, almond, or peach roots. And in the selection of specimens some nurserymen have not been as conscientious as they should be. We should use the Myrobolan plum altogether, while others, in consequence of this great demand for plums, have selected seedlings, and these little sprouts, as Mr. Haines suggests here, and adopted

them as a stock. Well, of course, they are a perfect failure. And again the almond root for a stock with a great many of our fruits will not make a close union, and the consequence is the joint will break in some of these varieties, in a few years they will get a little top-heavy and break, and upon examining you will see the union has been perfect in the bark but not in the heart of the tree, and we should be very careful in that thing, and not make a failure that we will regret perhaps the length of our lives. Again we find, in my experience, on the sandy soils that the peach root is the root for us to use. It seems to partake of the stock or graft you adopt. For instance, if you use an almond or peach it seems to give new vitality to the peach root, and its roots will go down according to the nature of the land. Again, if you use peach on peach root, which is usually deep, it will partake of the nature of the deep tree. We ought to be very careful in all our selections, and not make any mistakes in our localities of the stock which we should adopt.

MR. JESSUP: The subject under discussion now is really an important one, especially so far as the stone fruit goes. There have been errors committed through nurserymen, either through ignorance or avarice in taking suckers as stock worked on, and that accounts for the trees blowing over. As he says, the sprout comes out of the root. It is generally selected with one root at one side. It never throws laterals out as a seedling would. If they took seedling plums, it might be less harmless, though that is objectionable, and as to digging the suckers up, as Mr. Haines speaks of, I have not yet been able to dig deep enough to stop them. I have dug down and found suckers coming up seventy feet from the tree which grew them; the parent tree would not measure over three inches in diameter. Mr. Blackwood had those trees planted some years ago, or his son in law, I do not know which, at any rate they are not much bigger now than when I took the orchard seven years ago, and I have grubbed them three times a year ever since I have been there, and I have not yet succeeded in eradicating the suckers, but the most important thing that I have found here is that I have trees in my orchard, planted by Mr. Blackwood, that I always supposed were Amarya, or Myrobolan, but lately, upon conferring with Mr. Collins, a nurseryman at Haywards, he says it is the plum called the Saint Julian in France, or the Brussels in England, and the Muribell in America. It is described as being the stock that the French have worked their plums on; their plums, peaches, and apricots. It is a large growing stock, and where the Myrobolan has a tendency to dwarf the tree, this makes a much straighter tree, and I am inclined to believe he is correct in the belief that it is the Saint Julian, from the fact that the tree grows very large, and does not show the tendency to throw out sprouts from the collar, as Myrobolan does, and it is free from that objection, and while the tree is slow in coming into bearing, after it once comes in bearing it seems to bear well and produce a good crop; and for the Washington plum, I do not believe there is a better stock in existence, and it apparently does well on nearly all kinds of soil.

I have got the Quackenbosh, the Washington, and the Coe's Late Red, and the Pond's Seedling, all put on that stock, and all show the same tendency to prolific bearing after they once get in bearing, and I believe, so far as a plum stock is used, either for plums, apricots, or peaches, that there is nothing known superior to the St. Julien, if that is the stock I have got, and I have no doubt of it. We have com-

pared the branches. In one or two instances where the tree was damaged, a sprout has grown up from the ground for a root right where the union was made in the nursery, and apparently below where the union was formed. So that I have no doubt but what the sprouts that we have seen on these trees is that of the St. Julien. It has no resemblance to the scion worked on it, or the variety worked on to the stock in its foliage or its buds, and from that I come to the conclusion that it must be the St. Julien. It is a large orchard tree, and if that is the St. Julien I would advise, by all means, to work it. The crop I never saw equaled. They bore last year the heaviest crop I ever saw, with a large fine plum, uniform in size and perfect. Off the fifty trees I took \$672 worth of fruit at canners' prices; and some of them were of an inferior kind, and I know suckering stocks that didn't yield as well.

MR. THISSELL: There is one stock that I think is overlooked in budding and grafting stock and trees, and that is the apricot stock. In my neighborhood I have noticed that the apricot stock does well. We have used it for three reasons; one is to produce early fruit. I have apricots, I first placed plum stock upon them, and I found it improved the character of my apricots, and my apricot is produced earlier by crossing the stock, and I also find that the apricots were planted on soil that is inclined to be wet and draughty, and also grows vigorously and does well where the peach root does not. I also found that the apricot, where planted on dry soil, stands the hot weather and grows very well. The reason I consider the apricot root valuable to bud upon and graft to mature early fruit upon, is this: the roots of the apricot tree spread out close to the surface of the ground, and hence when the warm weather comes they get the benefit of the heat and produce early fruits, earlier than fruit that is budded upon peach trees; hence I think that many would, by investigation and trying the apricot root, find it preferable, and it would do in many situations where neither the plum root nor peach root do well.

MR. I. A. WILCOX: I think you might estimate as a general rule that it depends on the character of your soil, and more on the moisture and drainage than anything else. A root that will sucker will sucker when there is water near the surface of the ground a great deal more than it will in dry ground. A peach is good in dry soil because of the nature of the root. The apple and pear are adapted to wet soils because they are not injured by moisture, so that we will say that any root that is spongy or porous in its character absorbs too much water and is thereby injured. You can take the peach root and bruise and put it in water and it is softened with the water immediately. Take a pear root and you can pound it and make a noise, and the same with the apple. Now, in Santa Clara County we have discarded peaches altogether on low lands and found it impossible to grow them there. The peach is a very much abused tree on account of its neglect on dry lands. Somebody said that the peach tree would attain an age of from twenty to thirty years if properly pruned. Properly pruning a tree helps the roots. If you prune the top you get vigor in the root, but you cannot injure the top without injuring the root. Circulation goes from top to root and root to top, and consequently there is much injury done by neglect of pruning. Now as to the Myrobalan stock referred to by Mr. Jessup: I experimented with some of that stock and got all the trees

of that kind I could get, and I find that they have done splendidly with me. The water will come within two feet of the surface, and will settle in the ground and raise near the surface, but the Myrobolan stock has done well. However, I am inclined to think it is not properly the Myrobolan stock. It does not bear the reputation here that it does in France. There it is a dwarfed tree and here it is a large tree. Mr. Blackwood will bear me out I think in that remark, as I purchased the trees from him two years ago, and he recommended them and they did well, and they will grow well in heavy lands if properly planted. I would state that I liked the Myrobolan stock so well that I have this year ordered a thousand trees, and I think I shall grow it exclusively on that heavy land, as I am confident of it.

MR. JESSUP: The Myrobolan is not essentially a dwarfed stock, but in planting you dwarf the size of the tree; it makes a large-sized tree—a large orchard tree.

MR. WILCOX: There is one thing about the Myrobolan, it does not spread out, but its characteristics are to go down. I put it pretty deep in the ground, and I find the roots inclined to go straight down. So with the pears; unless you come near the shoulder of a pear tree, you don't strike it; but if a plum tree is not pretty well down, you are apt to hurt the roots by tillage, and then you get your suckers. I noticed on many low lands, where I didn't put my pear trees deep in, I was injured by suckers, and those I did put in deep did not sucker, and I have no suckers on the high lands. We have trees in Santa Clara County that are thirty years old. Two years ago I took a premium for the best pear exhibited in the county. We have a tree in Santa Clara County on that kind of soil, perhaps a hundred years old now, and on that kind of soil it does very well. I have never seen a pear tree more than two hundred years old, but in Santa Clara County, where the soil is five hundred feet deep, I see no reason why they can't grow to be a thousand years old.

MR. CHAPIN: There is one point, in reference to different sections, that must be borne in mind by the planters of orchards, that the locality must be considered before the stock is chosen. Now, only two miles from Mr. Wilcox's, who recommends to you the planting of the French prune upon the Myrobolan plum stock, I find that this stock does not succeed at all. The peach, the apricot, and the almond are throughout this region the only stocks that will do for the prune. That rule holds true in a remarkable manner throughout the entire State. I will mention as an illustration of that, Santa Rosa and Sebastopol, only six or seven miles away; at the latter place the French prune on peach stock is successful, and the same fruit on peach stock at Santa Rosa is a failure. At Santa Rosa almond stock is the one above all others. These are bearing trees for some years, and there are some trees on almond stock that bear heavily. In some of our orchards of apricot stock are large French prunes that have been in bearing a number of years, and they consider this good stock. As I have said before, the success of the different stocks depends altogether on the locality. The consideration must be that there is good union between the stock and the bud, for, as you well know, a tree of one kind will do finely upon one stock, and not well upon another.

MR. WILLIAMS: Do you know whether those stocks were double

worked or not? If you knew that, then perhaps you could tell whether they made a perfect joining or not.

MR. CHAPIN: They are on apricot roots and apricot trees.

MR. WILLIAMS: I would like to say a word with regard to the use of apricot roots. We have entirely abandoned it, as it has a great tendency to have the gum disease, and when the trees are from ten to twenty years old it appears. I have known many trees to die within a week from exudation of gum, and a tree is dead before you know it.

MR. AIKEN: I would like to ask whether any one has worked plums on the apricot or almond?

MR. WILLIAMS: I have, sir, in many instances. I mentioned that in Los Angeles and Fresno such had been the case. I would not be positive, but think it has been so in San José also. The trees were but six years old.

MR. W. B. WEST: I have some trees in my orchard which are from ten to fourteen years old; they have almost all been blown out in the last few years. They have become very large in size. Most of the apricot trees in the county were destroyed by the flood of 1862. Every one that I know of was killed in consequence of the great quantity of water that we had.

MR. FRASER: I would like to inquire if any one has ever tried the French prune upon its own stock to know what the result will be.

MR. WEST: The French prune grows very easily. I used them for stock a great deal. I would like to say a few words about seedling stock. I have raised a great many seedling plum stocks, and my first orchard was in trees that I grew myself. I grew the stocks in California, and I never saw such a quantity of suckers in my life as I saw in those seedling plums. They were grown from stock which they grow East. I planted the tree and grew the seed in many places, and tended them and budded them. They were from the seed of the horse plum.

MR. FRASER: What was your success with the French prune?

MR. WEST: Well, I budded them with a great many others, and I could not tell. I may say that the trees there were less objectionable than the suckers. However, experiments may have been made in other localities since with better success.

Here a recess was taken until one o'clock P. M.

Afternoon Session.

The Convention reassembled at one o'clock, pursuant to adjournment, President Wickson presiding.

PROFESSOR DWINELLE, the Chairman of the committee appointed to consider the subject of endowing an Entomological Chair at the State University, by voluntary contribution, reported the following results:

WHEREAS, Great losses have been incurred through the ravages of insects by those engaged in the various branches of agriculture, stock raising, mercantile, and other pursuits, as well as in the household and public institutions, often involving the comfort, health, and even the lives of our citizens; and whereas, these evils are likely to be multiplied by the importation of additional pests from other States of the Union, and from foreign countries; therefore,

Resolved, That our hope of radical remedies for these evils lies in a general knowledge of insects and their habits, and that such knowledge can best be disseminated by instruction given in our public and private colleges and schools; therefore,

Resolved, That, as a means of securing such instruction, we recommend the endowment of a Chair of General and Economic Entomology in the University of California by subscriptions

of agriculturists and others who appreciate the importance of such action, and advise the appointment of a committee by this Convention, who shall present this matter as urgently as possible to the citizens of California.

C. H. DWINELLE,
WILLIAM JOHNSTON,
S. F. CHAPIN,
MATTHEW COOKE,
A. T. HATCH,
E. J. WICKSON.

The report, after discussion by various members of the Convention, was adopted.

MR. COOKE: It is not to be expected that the agricultural community of California should understand and appreciate the necessity of this proceeding, but I will say, after nine or ten years personal investigation of this subject, that I think it is the best investment that the agriculturists of California can enter into. It appeals, not only to the members of the Fruit-Growers' Convention, and the vine growers, but to all tillers of the soil. I have spent many years in the study of insects that attack fruit trees and vines. You will all remember a little insect that appeared in Santa Cruz County; it was unknown. There was a great deal of newspaper comment upon it. It only commenced there about the first of April, and on the first, second, and third of May it had so increased that many crops were spoiled. There are very many insects, and very many new ones yet to be learned. The only successful way to combat insects is to get a full account of the life and habits of the insect. It would take a couple of days to sit down and write out a single one. We must have a Professor who will take a lively interest in the subject, and it will be a very profitable investment.

The expense is too great for any one here to bear. It must be done by the community at large. I will say it would be nearly hopeless for the farmers of California and tillers of the soil to go before any Legislature and ask for twenty-five thousand dollars for any object. The only means is by private subscription. I spoke to a gentleman last night who was not interested in agriculture, and yet he put his hand in his pocket for five hundred dollars for this endowment. The farmers and tillers of the soil, with nominal subscriptions, can collect enough, and it will pay them one thousand dollars for every dollar spent. Insect life is multiplying, and it is time for the farmers to protect themselves. We have not time to wait. The thing is growing so fast that the sooner it is done the better. The only hope of this country is in Young America; that is, by educating the educators of the rising generation. If you want to endow a chair you must have some such man as Riley, or Thomas, or a man who occupies such a chair in other States. Half-way measures won't do, but the farmers of California must enter into the work heart and soul, and make a chair for Entomology at the State University as soon as possible.

MR. CHAPIN: I heartily concur in the opinions expressed by Mr. Cooke, and in the necessity for establishing such a chair at the State University. There are questions constantly arising in the agriculture and horticulture of this State whereby all our interests are affected, to a greater or less degree, that require a fountain-head of information—a place to which we can forward our questions and receive answers. It is a chair of as great importance, perhaps, as any of the chairs of the University. It is the practical part of it that we

want, in the money-making interests of the State, putting it upon that ground of pecuniary interest to the citizens of the State. This question has been agitated at each Convention held for several years, but it seems almost impossible to get the people, as a general thing, sufficiently to appreciate the importance of it. I hope this question will be brought before them in such a light as to convince them of the propriety and necessity of the work, and hope that the chair will be filled by a competent entomologist, one from the East, who is capable of placing the subject on the footing it deserves.

The Secretary of the State Board of Horticulture has a list of the names and addresses of three thousand fruit growers and others who are directly interested in this proceeding in this State. Now, how many of all that number are familiar with the amount of mischief done by these pests, which are ruining many of our orchard trees in the State. It is very important that a certain line of knowledge be distributed among them, in book form if possible, so they, without a great deal of study and care, can obtain the information they need to enable them to understand the work of certain insects which are annoying them. There is no question that a book of this kind, which has never before been possessed on this coast (not the large scientific works on entomology, which are beyond the reach of many), would be of immense value. Just such a book has been produced by Mr. Cooke, which a child can understand, and I hope that every orchardist will buy that book for his own information and for the purpose of waging war on these pests. There is no State in the Union, nor any country in the world, that has made the same progress in real, practical entomology (as it is called) that California has done in the last three years.

MR. HILGARD: I will say that it has been my endeavor, ever since I have been in the State and connected with the University, to make it the headquarters at which inquiries after truth in regard to these different branches can be answered, but it is almost impossible to keep up with the demand with the present force at our disposal. We have two different branches to deal with, but I consider the practical questions of experiments in regard to agriculture the most important.

DISCUSSION ON THE SUBJECT OF NEW FRUITS.

MR. BLACKWOOD: Experience has taught me that it is always best to rely upon known standard fruits to propagate from. I would suggest to any one thinking of putting out an orchard to inquire of orchardists, or reliable men, as to what sorts of fruits he can plant successfully, and what kind of fruits the market may demand, and to be guided by what he may learn from such men. It is unsafe to plant a new variety of fruit, because it is uncertain whether it will succeed, and if it does, it is uncertain whether it will take in the market. We have plums, apricots, peaches, apples, and pears, all desirable for market fruits, and it is such fruits that persons setting out an orchard are desirous of getting. Therefore, I would advise those who contemplate setting out an orchard to adhere to all well established varieties of fruits.

FREE BOXES FOR FRUIT.

MR. HATCH: I do not know as I can say much on this subject. I will start it, however. I believe the best method that can be adopted

in the localities where they are not troubled with the codlin moth and other pests, is not to receive the return package, or box, and to use new boxes entirely. In regard to the expensiveness, which some speak of in arguing against it, I should think that that could be figured up in a way to satisfy all fruit producers in favor of the free box system. Although infected to some extent with the codlin moth and slugs on our pear trees, we think we may keep out pests to a great extent by doing away with the return box system.

MR. DWINELLE: I hope that those present who have practically tried this method of shipment in free boxes will give us their experience, particularly, as to any change in the practice, with that of others during the season, whether there has been an increase in the proportion of free boxes, as against return boxes, in their neighborhood.

MR. AIKEN: In regard to this subject of free boxes we have had a great deal of experience at Wright's Station in the Santa Cruz Mountains. We have never used any return boxes for all these years, and we ship a great many thousand boxes of fruit yearly. We have at that point a large supply of valuable redwood timber. We make grape boxes to cost about four cents, and apple and pear boxes that don't cost more than double that amount, so we get them pretty cheap, and we can afford to take the free box for many reasons, principally on account of the pests, and by so doing, we have kept that section of country almost entirely free from every kind of pest. We have had the codlin moth in but a very few instances in some of the late orchards. This we have held back by this experiment for many years, by never sending a box back from any source, or for any purpose.

I think if a man brought the same boxes back again they would be destroyed, because there has been such a feeling against anybody who would bring back a box for any purpose. We find it very much to our advantage. We consider our fruit of first quality, and we claim that we get the best prices in the market. I suppose an apple box made of Oregon pine would pay as well. Our redwood boxes last to get our fruit to market, and we can afford eight cents, or ten, or fifteen cents for a box, and give it away with the fruit. It is much more satisfactory. We put on the market an apple box that looks inviting, that is clean and looks to be free from all kinds of pests, and buyers and people generally will pay a better price where they have such a box, and don't have to return it.

MR. JESSUP: I think that there would be but very little loss in the adoption of the free-box system, inasmuch if everybody adopted a free-box system, the railroads would necessarily come down in their charges. The expense of returning those packages, which, as a matter of course, makes the freights higher than they would otherwise be, is to be taken into consideration. As far as my experience goes, I find but little difference in the box being free, or returnable, except in one case; that I think I have lost fruit enough by the codlin moth this year to pay my box bill for seven years. Although I do not presume that it will check the transportation of the codlin moth by any means, I think that the orchard, to be kept clear from the codlin moth, should be far removed from where there is any transportation at all. We know that the mode of the commission merchants is to collect their empty boxes in piles. They stand up in the store with

the larvæ of the codlin moth in them, and they crawl out of the fruit and into those empty boxes, standing there quite awhile. We know very well that the larvæ of this moth, after arriving at its perfect state in those boxes, being there but a few days, is still active and lively, and do not become dormant until after the lapse of a few days, and in the vibration and change of those boxes in the cars or wagon taking them to your orchard the larvæ will crawl out of the boxes and locate somewhere else. You will find them in your orchard, you will find them also in packages that come from the commission house, and no matter whether it comes from the commission house or cars that carry the boxes, the larvæ, in the vibration of the car, or moving of the cargo, will, some of them, seek a new hiding place, and they are just as liable to seek a hiding place in your drygoods as anywhere else. It is my opinion that the codlin moth, where it has been taken to orchards far removed, has been introduced in that way. I do not think we will ever stop the transportation of the larvæ in any way for that reason, but we can curtail it a great deal by not returning empty boxes. I suppose one half is taken in that way.

MR. DE LONG: I want to say one word in this connection. I am thoroughly satisfied our whole trouble came from returning boxes. I watched, for my own satisfaction, the return boxes, and found that nearly every return box had the larvæ of the codlin moth in it. This year I went into the free-box system, with the exception of some plums shipped from Petaluma to the city, and when they came back I scalded them thoroughly. I have bought the cheapest boxes I could get, and they are disposed of readily in the market. The commission merchant is glad to take the free boxes, and can even get a better price for the fruit. We must look out for those men who buy up the old boxes as a speculation and resell them to us. The only way to avoid this danger is to have the commission merchant burn or destroy such boxes.

A letter just received from ELLWOOD COOPER, President of the State Board of Horticulture, was read:

SANTA BARBARA, November 17, 1883.

Dr. S. F. Chapin:

DEAR SIR: * * * I cannot be present at the Fruit-Growers' Convention, neither present a paper, sickness having made it impossible for me to write an essay. * * * This is my excuse for not writing, and one that was unavoidable. I am, very truly,

ELLWOOD COOPER.

A letter and paper from THOMAS H. DAWSON of Orland were received, but owing to the lateness of the hour their consideration was postponed.

The HON. WM. JOHNSTON presented the following resolution, which was unanimously adopted:

Resolved, That it is the sense of this Convention, that Matthew Cooke's work on Economic Entomology is good authority, and that it ought to be in the hands of every fruit grower in this State, and it is also recommended that these books be placed in every school library in this State.

ORCHARD CANNING.

[BY R. WHEELER.]

It is not necessary for time to elapse to demonstrate that the fruit canned in the orchard carries superior merits so strong as will meet with ready sale upon the exhibition of the article. Richer in flavor,

richer in appearance, and stronger in fibrous cohesion, makes it bear transportation better than that put up at a distance. The superior quality of California fruit is not known to people far off. They receive such goods as would make the orchardist indignant, were they presented to him as either an article of food or a luxury. They carry no merit other than the name that they are California grown fruits. They have gained only a reputation and buyers, by the scarcity of similar fruits in the countries where exposed for sale. At this day we hear expressions of opinions strongly condemnatory of them. These expressions of dissatisfaction are growing louder; comments are being rapidly multiplied, and where this revolt against some of the stuff called canned fruit is going to end is a matter that is becoming a very serious question with the canner and the fruit grower.

The canner who is honestly endeavoring to place good fruits before the public is met in the very outset with such difficulties as neutralize his efforts. If he is located at any distance from his fruit supply, his fruit, to reach him in any condition of firmness, must necessarily be picked green; destitute of the rich qualities of the fruit, it goes into the can; to endeavor to supply the flavor lost, sweetened water is used, and in this manner is given to the world by the canner the delicious peach and the richest of canned fruits—the apricot. Alas! only in name can the painstaking processor give to the consumer the fruit called for. If he should give orders to the grower to pick the fruit near the verge of ripeness, the transporting of it a short distance crushes the fruit out of shape, and when it is canned its symmetry is lost, and it is given to the consumer in a mushed and disgusting condition.

The inability of obtaining fruit in its proper condition for cooking is due to the failure to locate canneries where the material is grown. From poor material it is impossible to expect a first class manufactured article, and when a factory is compelled by a combination of circumstances to put forth a poor piece of goods, its vigilance will necessarily relax to that extent, and in a very short time this absence of pride will lead it to the distribution of inferior grades until its quality has descended to the lowest scale; and how many canneries in this State have already reached that point.

It is an unfortunate, but nevertheless a true fact, that this country, which raises the finest of fruits, has their qualities most miserably represented. What fruit grower in this Convention can say that he ever partook of a first-class article in the shape of a canned peach that was not put up in the orchard? I doubt if there is one, and this superiority is going to lead to the doing up of fruit just where and when all its essential qualities are developed—upon the orchard, and for the annexed reasons:

First—That fruit only when in a ripened condition possesses its true, rich flavor, and when in such a condition transportation of it a distance is impossible without bruising it.

Second—The excessive tax upon city canneries by shrinkages in weight, by lack of resources to can the article in a rush, adds a burden that will ultimately lead to disaster.

Third—The unsatisfactory manner of canneries doing business with the growers will continue to intensify the feeling of dissatisfaction now so largely existing, and as the grower enhances his wealth the more certain is he to provide himself with such appliances as

will save his crop and release him from the bondage of but one broker.

Fourth—The profits in canned fruit, when relieved of those onerous burdens mentioned above, gives to the grower a good price for his product, besides a market in another shape, and also enables him to build up a future market that is now necessarily lost.

Fifth—The great wastes of orchards must in the future be saved, and this saving will lead to canning of these "culls" as well as to their drying.

My experience the past two seasons in the art of canning fruits upon the orchard has been as great and probably more varied than any within the sound of my voice. Closely studying the problem, and practically testing all the theories, has convinced many others besides myself that the time is very close at hand when the fruit-growers product, to a very large extent, will be sent to the market in a canned shape. There will be certain obstacles to overcome, but the magnitude of them is more imaginary than real. A good article at a moderate price is never a glut, and every fruit-grower's wife is as well informed how to produce this first-class article as the highest priced processor in the State, and, in some respects, better qualified, as she will see that it is put up in a cleanly manner.

The next consideration is that of labor. "I have my own knowledge gained by experience, and you have your set ideas, which argument will not change, and you will never be convinced until you practically test it," is what I have very often said to those who dispute with me the question of orchard canning. Now, let us see what one Chinaman will do in ten hours with the improved appliances: Of apricots he will cut, place in can, and cook ten dozen in ten hours, at the following cost per dozen:

Cans	\$0 48
Sugar	37
Labor	12½
Capping, etc.	10
Labels	5
Cases	9
Twenty pounds of fruit at 2½ cents	50
Add 10 per cent for contingencies	16
Total	\$1 87½

Being the cost at which an orchardist can put in market an extra quality of canned apricots, equaled by no cannery in this State. Now, in what other branch of the business of growing fruit can a laborer be so profitably placed.

I would under no circumstance advise an orchardist to can his whole crop the first season; on the contrary, I advise him to can only a small part, and increase each succeeding year, as his market and experience grows greater. The samples of fruit which I have shown you, and of which many of you partook, are the "culls"—the very refuse of the canneries on account of their lacking size; and yet this inferior fruit, allowed to ripen upon the tree, exceeds in flavor and appearance the very best extra qualities of the standard companies. There is no disputing this. Would it not pay you growers to take your labor from some less profitable source and put it to canning?

The market, labor, and cost I have treated upon, but so far I have related the experience of no one. Mr. G. W. Thissell gives as his

experience, selling his peaches in glass at \$3 25 per dozen, netted him seven and a half cents per pound; in tin, at \$2 25, netted five and a half cents per pound. His apricots in glass, at \$3 25, netted him ten cents per pound, and in tin, at \$2 25, netted him seven and a half cents. I have cited Mr. Thissell, because he is here with us, and, therefore, if I have quoted him wrong he is here to correct me. What Mr. Thissell has done you can all do, if you will try.

I intend to make here a broad assertion, and it will probably lead to some argument. In my travels through the different fruit-belts, I have failed to find yet an orchard which did not have a greater or lesser waste, which fruits could have been made by the careful housewife into fine jams, jellies, or goods in glass, all of which would meet with ready sale, and bring many a dollar in pin-money to relieve the toiling and debt-burdened husband, and this at but little discomfort. In preparing fruits there is nothing intricate. The syrups are made by the dissolution of a certain quantity of sugar in a proportionate quantity of water; the jams are made from the overripe fruits, and a certain quantity of sugar, and your jellies should be made from the green fruits. A considerable amount of first-class jelly stock can be obtained from the fruit lost in thinning.

In conclusion, I will say, place the results of the labor you employ for canning against your labor for picking, packing, etc., and figure which is the most profitable; you find the cannery side is greatly the creditor. In the State of Maryland, where the fruit and vegetable growers were harassed with the same troubles affecting you, and which threaten to increase, they made themselves independent by canning upon the orchard. If I have failed to go into details as to the making of these goods, it is purely through the fact that you are all as conversant how these goods should be put up as the most talented processor in the land. In Oroville, where I put up for Messrs. Perkins & Gray a five-thousand-can cannery, a woman was enlisted as superintendent, and the fruit put up under her supervision was not only good, but it was put up in a cleanly manner. How many canneries can say they put up their goods the same way?

Now, in closing, let me say to all of you, that the time is not far distant when the orchards will do the principal part of the canning. In every case when canning fruit put yourself in the position of the buyer; always recollect that the same desires for clean, ripe, and rich dainties exist as strongly in other appetites as in yours, and that they are as willing to purchase. Have no fears of ever glutting the market with the superior articles you can produce; on the contrary, as your goods become better known, there will be an increased demand for them; and always recollect this axiom, when canning or making jellies or jams: "What is worth doing, is worth doing well."

On motion of MR. WEST, the Committee on the Endowment of a Chair of Entomology in the State University was continued.

DR. CHAPIN said: I would move that when this Convention adjourns it adjourn to meet next year in the City of San Francisco, under the auspices of the State Board of Horticulture, the time and place to be fixed by them. The motion was adopted.

HON. WILLIAM JOHNSTON spoke upon the failure of the passage of the penalty bill in the Legislature, for relief from the insect pests, and advocated decisive and concerted action by the members before the next Legislature.

After which recess was taken until half-past seven o'clock P. M.

Evening Session.

MR. JESSUP: I have not had a great deal of experience with borers, but what I have had has been highly satisfactory to me. I found that that hot Summer we had about five years ago had burned many trees very badly, and from that they got infested very badly with borers, and I came very near losing a large portion of my orchard in consequence of the way I went to work to get rid of them. It was the native borer—I forget his scientific name. At any rate, I scraped the trees very closely, taking off all the burned wood, and cutting the bark with a sharp knife until I got into the fresh bark, so as to give it a perfect chance to heal over and make a good union and cover itself, and then I put gunnysacks on for the purpose of killing the borers. I did not think of it, and I wrapped the trees and began digging round the roots, and I was surprised to see some trees that I had not taken the borers out of commence to revive. On examination I found the borers all dead, so I tried an experiment one year, which I didn't conduct to my perfect satisfaction. I took a tree, after satisfying myself that it was full of borers, and covered the trunk with sacks, wrapping grain sacks around it, and when I examined it in the Fall I found no borers in it. Still, it was not a perfect success, and the following season I made up my mind that I would try another experiment and satisfy myself thoroughly, and I told one of my men to select a tree that was the most affected. It was a cherry tree that was probably fourteen inches in diameter, with the branches four or five feet from the ground. We examined it, and found it literally alive with borers. I took the sacks and wrapped them double or treble thickness around it. In the Fall Professor Dwinelle was there and couldn't find a live borer, but found plenty of dead ones. Even the beetle that had fully developed had eaten its way out to the mouth of the hole, its head sticking out; it crawled out there and died. Professor Dwinelle took two or three of the specimens out himself, and under the bark were pupæ partially developed. They had entered a kind of chrysalis state, ready for the final development; they were also dead, and every insect I found on it was dead.

I had always supposed before that the beetle by some instinct had selected and always did select the southern side of a tree for depositing its eggs, and in order to satisfy myself of that, I took my knife and shaved off the tree bark until I came to the bright green underneath, and I found there some indications of the beetle where the egg was deposited on the north side as well as the south side. Wherever I find the beetle, it is by following up the incisions where the bark had been punctured by the insect. Where they had punctured the bark before depositing their eggs, we could discover with a glass, on the south side of the tree, the development of the insect. The egg hatches out into minute little maggots, and then we can follow them around the tree. Around on the west side the same indication of puncture was visible, precisely the same as that on the south, but no evidence of life, and I had never seen these eggs hatch out on the north or northwest side of the tree. But still, for all that, the same indications are there; but by wrapping the tree and protecting it from the hot rays of the sun or heat, I think I can reduce the temperature, and as it requires a certain degree of heat to hatch out the

egg, or to sustain life, this being lacking, the insects die. I cannot account for it any other way, unless it be the exclusion of air, but a variety of borers fill the hole after them as solidly as wood itself, so I think it was the temperature which, in this way, was kept too low to develop the insect. I can recommend from experience, that this is a perfect means of protection against borers.

PROFESSOR DWINELLE: I was very much interested in this experiment of Mr. Jessup and can vouch for the things as stated by him. I am not prepared to state conclusively as to why these insects in different stages of development are destroyed. I should like to have followed the matter up more closely if I had had time, and repeated the experiments, but I do not hesitate to say, in a general way, that the borers that are most mischievous on this coast, so far as I have observed, are the flat-headed. One of them is quite small and the other is a little larger. So far as I know, they never attack really healthy wood, but it is almost always sunburned bark and wood that has been attacked. The protection is, in the first place, for young trees that are taken out of the nursery and have there had shade and have been growing rapidly, and being set out in the open air are exposed to the rays of the sun, to shade them from the reflected heat of the bare ground. They are at first put to very severe trials, and liable to be sunburned. You can protect and shade them in some way by sticking up leafy branches of corn stalks in the ground, the tops resting in the first forks of the tree, or a couple of shakes tacked together set against that side of the tree, so as to shade the south and southwest sides. We have a great deal of evidence in favor of the idea that the damage is done in the afternoon, probably between twelve and three o'clock. Usually it is the side of a tree that is exposed to the rays of the sun at that time when the heat is still great and the sun has declined enough to give the rays of the sun more direct force on the bark. Many say that they find ample protection in a thickness of old sack wrapped around the tree to the first fork, and perhaps that is as good and cheaper than anything else. Newspapers torn up and tied in strips, one end tied to the bottom and the other as far as the fork, will give a clear surface which will not absorb the heat.

The first borers that were called to my attention were some that were sent to the University by a gentleman who had gone into the country to make a home or sanitarium, and his orchard had been ruined by flat-headed borers. After some inquiry he found certain remedies to prevent them. He was sure that he had taken every precaution in setting out those young trees, so far even as to paint them with coal tar—in other words, insure their protection by putting on a black surface which would absorb the heat of the sun and cause them to be blistered, which is the proper thing for the borer.

In response to an inquiry, "Where do borers come from," the Professor said:

One or two of them have been imported, I cannot say how many; we have natives. There are a good many borers that are new on the coast here. They call them flat-headed borers. They have a big head, and the rest of the body is very much smaller in proportion. Now, actually, they have a very small head, but the second segment, or thorax, or ring of the body, is very broad, and that is generally called the head, but the head is very small, while most of the body

is a light cream color. The head with its mandibles is dark brown, with a little pair of forceps in front that are very sharp.

There is one point in protecting the tree; you must make the stem as short as possible. I believe in making the head of a tree low, and making your branches spread low, so that they will soon furnish shade for the tree. I think, in localities very subject to intense heat, and especially at that time of day, it would be a decided point in favor of the setting of the tree to grow them so that at that time of day each tree will shade its neighbor by casting its shadow; that is, plant your rows in such a way that each tree will get the shade of its neighbor. An orchardist called me in and wanted to know what was the matter with his cherry trees; a great many of them were dying. Some of them were as high as this room, and a good many had been bearing for a number of years. It appears that in spite of all our precaution we are sometimes in very great danger; our trees will die and we are unable to discover the cause.

MR. JESSUP: The cause of the trouble at Berkeley was that those trees were planted out in the dry season under unfavorable circumstances, and in a place that was formerly used for a hog pen, and the manure of those animals is poisonous to a cherry tree, and the result was that the tops kept dying down, and occasionally a whole limb would break off.

MR. DWINELLE: At Berkeley we had that hot weather, and tops in many instances were killed in two or three days, and when trees get in such a condition the borers are very apt to take possession. These borers all belong to the predacious class of beetles.

MR. JESSUP: I understand Mr. Dwinelle to say, that he didn't think those borers ever attacked a strong vigorous tree. In that he is mistaken. They attack all trees, and almost under all circumstances, indiscriminately, regardless of their vigor or anything else; but where a tree is extremely vigorous, I think it resists the attacks of the borers, and will drown them out by a vigorous flow of the sap, or other circumstances combined. Of course a tree will suffer, even if properly shaded, about the noon hour during the hotter portion of the day, but my experience so far has shown that borers will attack all trees indiscriminately, and that the harm is perhaps attributable, to a great extent, to improper pruning. No young trees should be pruned so high that the expanse of the top does not cut off the rays of the sun for some hours from the trunk, from, say half-past nine to half-past three. I think that should be borne in mind by all in pruning trees, to remove the lower limbs just so fast as the higher ones will extend out to shade the tree, and to that extent not further to reduce the top, and in that way you give them time enough to make growth sufficient before the hotter portion of the year. This is one good reason why so many young trees are killed by borers; this indiscriminate pruning running up too high. It injures the trees in other ways, as well as exposing them to the rays of the sun. It retards the flow of the sap, as everybody knows that the branches of a tree aid in the enlargement of the stock. That is one object in cutting back the limbs and shortening the limbs, and you will probably find that the next year they are one third larger than the limb of a tree that has not been touched at all. The same rule will answer in trimming up a tree; for instance, you may take two trees of equal vigor, and plant them out ten feet high, or six or eight feet high, and prune one up a foot or fourteen inches and cut off the top, and the

other we will prune up eight feet, and the result is that the one you leave the limbs on low down will be four times thicker in three years than the one that you trimmed up so high; and not only that, but the exposing it to the inclement weather, the hot rays of the sun, and the sudden cooling by the wind coming up, and the cold winds in the evening, all of which are detrimental to trees.

MR. DWINELLE: I did not mean to say that insects will not lay their eggs or make an attack upon a perfectly healthy tree, but I never saw any damage done. I think it would take close observation to find them on real healthy bark. There is considerable truth in Mr. Jessup's idea, that the larvæ may hatch out and be drowned out by the flow of healthy sap. We have instances of that in various ways; sometimes the flow is strong, and apparently the larvæ is drowned by the abundance of the sap; in fact, it is a theory that the little incision made by the plum weevil is for the purpose of preventing the too free flow of sap, or the too great pressure upon the egg that is placed in the puncture which has already been made; in fact, there are a number of cases where this free flow of sap seems to be detrimental to the boring insects.

MR. JESSUP: I can mention one instance where trees of vigorous growth were destroyed some three years ago. I planted them out and they grew strongly and vigorously, but the eggs of this borer had evidently been deposited upon the trees in the nursery, and while they were making this strong, healthy growth, as strong as any young trees I have in my orchard, I discovered all at once that they ceased growing. There were some forty of them, and when I came to examine them to see what was the matter, I saw the bark crumbled up at the bottom, and I found them completely girdled with the borer by running up and down three or four inches clear around, taking out about an eighth of an inch of the tender wood, and killed them completely.

MR. AIKEN: I had some trees, and I cut them so as to have the branches down near the ground, and cut them back, and let them branch out low down; besides that, I shaded them very well with a wide shake, and the trees did well. I did not notice anything the matter with a solitary tree. This Spring I looked them over, and noticed that there were some limbs too low down, and I took out a few, and I didn't put shakes around the trees this year, and didn't lose a tree. It might be true in our section, where we have long Summers and they are not so very hot, and it might not be so true in the valleys, where they have such hot Summers. I do not think I lost more than ten trees from borers, but that taught me a lesson to let the trees start low down and branch out, and I believe with Mr. Jessup that a tree with a strong, thick trunk is healthier, and I believe it will live and prosper more than a long-bodied tree, and, of course, it is easier to prune and easier to pick the fruit. The Newtown Pippin does not sprawl around like some other apple trees; so, my opinion is that a Newtown Pippin tree can grow on twenty feet, where another tree would not grow to advantage on thirty-two feet. We found that the Newtown Pippin would not grow to occupy the room of a Yellow Bellflower or some other varieties. I have also the Sonoma Seedling, some five hundred of them, and they have done exceedingly well. I have not lost any of those by borers; unfortu-

nately the limbs grow out higher up, and I took the pains the first year to shade them, and I lost one of those by borers.

I remember some years ago I had some prunes that I did not guard very carefully by shading, and I lost some of them by borers, but it was entirely the fault of the people at the house that proper care was not taken with them. The first year they were not properly shaded, and they were pruned a little too high; and so I say, prune so as to let the limbs form the shade, and then you can remove the limbs afterwards if they are too low, and they do well. We have a cherry orchard of some three hundred trees, most of them Black Tartarians, at one time a very fashionable cherry, and they are very healthy. I noticed a few trees, for some unaccountable reason, would die from some disease incident to the cherry tree. The tree looked healthy enough, but it simply died. I did not care much, as I did not value the trees highly. We are also troubled by what some term the gum blight of the cherry tree. There is something peculiar about that. A new growth of wood which we depend upon for our fruit from the year before, within a day or a week you would find the leaves all dying and the tree would die clear down to the old parent stock. I do not know whether the old wood is going to die or not. Mr. Munroe, who has a large crop, is also troubled; I guess one third of his peach orchard is troubled in that way. I do not understand the reason of it. Some people say it is a stoppage in the flow of the sap, but the upper limbs seem to be healthy, and it is just these young, thrifty, juicy, sappy limbs, the late growth that you depend upon for your fruit, which die. Whether next year the fresh wood will grow out again and the tree bear fruit, we cannot tell. The only treatment I would give such a tree would be to cut it down near the ground and see if I could not get a young growth of wood again. I would like to hear some explanation of the disease. I have heard that they are also troubled with it in Sacramento County. About four years ago, the same thing happened, and trees that were ten, twelve, and fifteen years of age died the same way, and were dug up and thrown away. These fresh troubles keep constantly coming along and astonish people who are raising fruit.

MR. COOKE: Mr. Chairman, very little has been said in regard to borers as to the amount of damage they have done, and are likely to do in California. There are some three or four different species of them, and they attack, not only apple and cherry trees, but even currants. There is the clear-winged moth—what is known as the *xegeria*—whose attacks are very sudden sometimes. I remember in 1880, I was up at the State Fair in Sacramento, and wrote to a friend that I would like to get some borers from currant bushes. He wrote back to me that he could not find any; three weeks afterwards he sent me a bagfull of currant bushes, all of them containing from two to three borers. Now, in Woodland it is almost impossible to grow the locust tree. I happened to be up there some two months ago, and got five different species of borers in the branches. It has got so up there that they can hardly raise a silver poplar. Last year I was down at Fresno, and a lady wanted me to go out and see some weeping willows that were affected. I advised her to cut them out and plant others. In splitting one of the stocks I got a pupa. I took the box to the house, and while looking at it the borer came out, so I was enabled to determine what class it was. About two months ago I received a borer of several inches in length from Mr. Crane of San

Lorenzo. He said that a farmer there had had a plum tree that had died from it. The same borer attacks the hop roots, and eats them out. Now, the clear-winged moth is getting very plentiful in this State. In my book I spoke of them, and a learned gentleman doubted that there was such a borer in the State. I believe now you can get any quantity of them. These borers do all their damage in the larvæ state; that is, in the second stage of insect life, after the hatching of the eggs.

We have three other borers in the State. I call one of them the twig borer. Last year there were some sent to Sacramento for exhibition. They have done immense damage to the plum and apricot trees, but, unlike the others, these borers, when in the perfect state, are beetles. The beetle attacks the pear, apricot, and plum, just where a little branch or a leaf comes out; they make their entrance there, and eat right into the pith of the wood, and go down into the twig about an inch, and consequently the branch withers, and when Winter time comes these little holes fill full of water, and that destroys the branches. There is a little olive orchard above Sacramento that belonged to the late Mr. Redding, and probably in the large trees there you cannot get one solid branch. I have found as many as twenty-two holes in these branches where they had worked in. A gentleman in Sacramento had a young orchard that was affected, but he would not do anything, and he came down to me and said, "I would like you to see my pear trees." I went up and found that some nice Bartlett pears were all withering. I took a branch and showed him where the insect had gone in. The next tree we come to we got the beetles in the hole. There is another small beetle that bores into the limb the same way that is doing a great deal of damage, and the only way to get rid of them is to prune close and try to destroy them, and burn all the wood that you cut off. This beetle is about half an inch long, and eats out of sight into the branch. There are different cherry tree beetles that are all borers, and they are doing a great deal of damage here, but, as Mr. Jessup says, where the trees are well shaded and the bark smooth but little damage can be done to the tree. It is those trees that get sunburnt and are not attended to that are worst off.

There is another borer, which is a larva of the peach moth, that has caused considerable trouble. It was first reported about two years ago. I saw traces of this disease at Mr. West's, and that was several years ago, but this last year it has been quite common around Sacramento. Nearly every bud on the young wood is dying, and if you take a knife and take it off you will find a slight indenture where the gum is oozing out. I think that is the work of this beetle. They go in there and lay an egg, and bore right into the wood, and you will find them in some cases two or three inches down in the wood. I have had specimens of both. I think there is one species, but two varieties, designating it as dark and light. They are about three sixteenths of an inch long, of a gray color, and they not only attack the wood, but they attack the fruit. This year they attacked Mr. Gourley's orchard on the Sacramento River, where they had never been seen before, and I saw boxes of peaches which were forty per cent infested by this peach worm. Dr. Chapin refers to them in his report. They attack nectarines, apricots, peaches, and plums. I think, from some examination I made this year, that it does its work as a borer, and attacks the tree, and gets under the bark. The borers

have done great damage, but I believe it is easy to keep them off by shading the tree and washing it often with soft soap or whale oil soap and sulphur, and the insect will not deposit its eggs in that tree.

We have found in the strawberry that there is a little beetle; the larva lives right down in the summit of the strawberry, just as the larva of this peach moth. The moth lays her eggs, and then goes down in the roots, and hibernates there during the Winter. There is also another borer in this State that we have found. There are several ornamental trees here also so troubled. The borers, I think, are spreading. There is a long-bodied borer that I have found; then there is this horn-tail, which is getting very plentiful in California. I first saw it about two years ago around Chico while waiting for the stage to take me down to the depot, and I saw on the opposite side of the street some cottonwood trees which were dying. There were probably some two or three hundred empty pupæ cases; they are now probably all dead. This year they have been found around Sacramento, and this horn-tail is very destructive. He is quite a long fellow.

So far as borers are concerned, we have any quantity of them in California, but I have noticed that where the trees are kept in good order, whether by pruning or properly shading them, the borers do not make much headway, and they do not make much headway in strong vigorous trees. Then we have rotten wood borers. I think probably in California we have forty varieties of borers that are really dangerous, and our only remedy against them is to keep the trees in good order, and if we find any sunburnt places on the trees, get some bar soap and rub it on, and that will prevent the female from laying her eggs there. Whether we have the peach *tree* moth, I do not know. I have never seen it in California. They attack the root at the ground, and work down the tree. I have seen the hole, but I cannot say whether they were still residing there or not. The flat-headed apple tree larvæ we also have, and the round-headed borer. I cut into the bark three inches the other day to find one. Mr. Hatch has had the same experience with borers, and has lost several fine trees by them. Some people recommended the driving of rusty nails into the tree under the surface of the ground; that it would free the tree of borers. He tells me that since he has tried this method, he has never been troubled. He cleans back the ground and drives some nails in just below the surface. He had been troubled to a great extent, and he told me two years ago that since he drove those nails in he had never been troubled with borers.

MR. AIKEN: Do you think borers were introduced lately, or that some of them have been here all the time?

MR. COOKE: Oh, we have undoubtedly imported some, but some are natives. We can hardly tell yet which ones are native with us. A gentleman planted an orchard of ten or twenty acres last Winter, ten miles from any other orchard in the country. This year he was attacked by a saw-fly. This saw-fly has never been reported as existing in the United States, yet it is common in England. I have some that were sent on to me from the East as specimens. There is a saw-fly found in Lake County that takes off the foliage from the young trees. Now, it may be a native of California, although it has been supposed heretofore not to exist in the United States. I wrote to the gentleman to look for it. In England the larvæ are generally found

along the banks of canals. Now, after doing all the damage they can, they have taken wings and departed. He says he does not know, but it was partly his own fault; that he killed some rabbits, and he rubbed the blood on the young trees, and he don't know whether that attracted the saw-flies around, but as soon as they did their work they went away again.

MR. A. H. WEBB: I have had some experience with borers. Some twenty-six years ago I put out a little orchard of ten or twelve acres. This was in the upper Sacramento Valley, where the sun in Summer shines with great force, and the land is dry and parched; and it is with reference to this section and character of land more especially that I wish to speak. It matters not how strong and healthy the young tree may be when first put out, under certain conditions, the borer will attack them. On the occasion I speak of, out of all I put out not one in twenty escaped, especially the apple trees, while my entire orchard was greatly damaged by the borer, of which there are several different varieties, the most destructive being the flat and round-headed apple borers. The attacks of this little insect is with wonderful method, and so insidious that the young tree is often girdled before the inexperienced orchardist is aware of danger. Such persons put out trees for their own use, and when they find their trees dead, being ignorant of the cause, conclude that their land is not suited for fruits, and are discouraged from ever repeating the effort, whereas with a proper understanding of the subject they might, just as well as not, have an abundance of the most choice fruits.

The great danger of the borer is in the Spring and Summer following the planting; still they do much damage the next year, but after that, with diligent attention, there is but little danger, except of a very hot season and dry year. Almost invariably the beetle attacks the tree on the southwest side, puncturing the bark, and depositing its little egg. It may be asked why is this so? Evidently because the rays of the sun has produced a fermentation of the sap at this point of the tree, and having to subsist on something, and preferring this sap to anything else, and being endowed by nature with an acute sense of smell, it is readily attracted by it. And, besides, it desires to deposit its eggs in a fertile and nutritious spot, that when hatched, the larvæ may be in the midst of sustenance, and in this way propagate its species. When hatched the larva commences, slowly at first, making its way to the wood, where it turns at right angles, usually towards the east, severing completely as it goes the inner bark. On arriving at about the east side of the tree it comes in contact with the sap unaffected by the sun, and in its normal condition distasteful, so it turns back, and in doing so, drops below the line or girdle just made, and, returning, cuts another line under and parallel with the first until it reaches about the northwest side of the tree, where encountering the same objectionable sap, it again turns back, and dropping below the line last made. By this time the tree is so affected by the damage already done, and the flow of sap so feeble, and the larva has so grown in size and activity, that now it cuts or rather *bore*s rapidly and soon succeeds in girdling the tree. There are cases, however, where the tree is feeble from having a small root, and planted in dry soil, that the borer proceeds at once to girdle, without meeting with any opposition.

It may be asked why the borer on turning back drops below the

line last made? Obviously, because it desired to be in the midst of sap, and to have ascended it would have been cut off from its base of supplies. The question may also be asked, why this little insect should work with such persistence, determination, and method to *girdle* the tree. Evidently because it wished to prepare for itself comfortable Winter quarters in which to remain during its period of inactivity, and to do this it was necessary to *girdle*, and so kill the tree, that the wood might be drier and warmer than if growing vigorously with a perfect flow of sap.

Now, the problem to solve is, what is the best method to guard against its ravages? To my mind the following course is the best to pursue: First, in selecting trees for your orchard get them from a nursery that engrafts but *one* tree on *one* root; select trees that have large and healthy roots. Some nurserymen, it is said, make sometimes a dozen trees from one root. This is not the kind you want, even as a gift. Dig your holes deep and wide, and not when the ground is too wet, and on planting fill the holes to proper depth for the tree; sift the dirt nicely in among the roots, which must be carefully arranged so as not to be in the least cramped, but as nearly as possible in the same position they were in when in the nursery. If any of the roots are bruised or broken, trim with a sharp knife. Cut your trees low down; the drier the land the lower, so that your neighbor would declare that you had ruined your trees. Now, the flow of sap from strong and vigorous roots being confined to so small a space will be so strong that the borer cannot thrive there, while, on the other hand, if the root be small and the trunk tall, the flow of sap will be necessarily feeble, and distributed in so great a space soon becomes affected by the sun, and in this condition invites the attack of the borer.

Now, after your trees are planted—and here let me say, never put out more than you can and *will* well take care of, unless it be in early Winter—give them, if possible, a good watering. This will settle the dirt in among the roots which will soon take hold of the soil and begin to grow. The necessity of shading being conceded, the question is what is best? I would recommend old cracker or other cheap barrels, with a third or more of the staves removed. Place these over your trees, with the sides where the staves are removed on the north, bringing it close to the tree on the north, so as to place the protection against the sun as far from the tree as possible. While the removal of the staves will afford a circulation of air, the barrels can be easily removed for cultivation or irrigation, and again replaced. For a large orchard this would seem impracticable and expensive; and if old barrels cannot be had, then anything in the shape of old boxes or boards with their edges nailed together. Shakes are hardly wide enough. The ground must be as thoroughly cultivated about the trees as if there was any other crop growing. I disagree with gentlemen who advocate the planting of corn or other crops for a shade, as anything permitted to grow near the tree, absorbs and robs it of its moisture.

I contend that the most troublesome borers are natives here. When I planted the orchard referred to, there was but one other anywhere near me, and that being on rich moist land, had no borers. Now, where did they come from? In this case they certainly were not imported.

MR. COOKE: The eggs probably must have been laid in the Fall,

and when you bought your trees, you bought trees with the eggs in them.

MR. WEBB: There were willows close by and I think they came from them.

MR. AIKEN: Those who have lands unsuited to the growth of the tree, cannot get that full flow of sap that would protect them from the borer, so that in those localities a great many have to give up the idea of raising orchards. But why should the orchardist despair? Such land, though unsuitable for orchards, is the very best grape land, and he can plant peaches and apples at a profit, and may plant that crop which will yield him the best return.

MR. JOHNSTON: Had I attended a Convention like this thirty years ago I would have saved money. Some twenty years ago I planted an orchard on the Sacramento River. I trimmed my trees up nicely so that I could plow up close to my trees, and the borers came and captured ninety per cent of them. The trouble was that I planted them so that the body of the tree was too high. Now, when I plant, I keep the branches within twelve or fifteen or eighteen inches of the ground. I never take a limb off a cherry tree, but let them spread out, so that when they are four feet high they are four feet across; but I never cut lower limbs. I cut them back and let them sprout right out, and many of the branches are within six inches of the ground, and I have not had a borer in one of those trees. My first orchard was almost destroyed by them. I had perfect success in guarding against borers in the later years, simply by means of trimming my trees, and they grew strong and vigorous and healthy. The first year, in planting out the orchard, I took a shake or clap-board about six inches wide and placed it about six inches from the body of the tree, so that the shade would fall on the tree at exactly one o'clock, or from twelve to two during the hottest season. After the first year I do not attach them at all.

MR. JESSUP: If the borers attack a tree, it can be told at a distance of ten or fifteen feet. The tree looks black or brown, as if washed with coal tar or oiled, and a moment's investigation will show you the reason. I have seen currant bushes growing vigorously, and in less than three days you will see all the fruit dead. They were loaded with fruit, and looked as if a fire had passed over them. The whole thing died right down, and cutting the stem up there I found it was hollow. In two or three inches I could find the larvæ from the chrysalides of the currant-borer. After continuous work and eating down into the stem of the currant bushes, it turns into a small chrysalis that wiggles its way out. I never understood its mode of locomotion. I was not long in removing all from the currant bushes, as I didn't want to affect my neighbors, and so I picked them nearly all out.

MR. AIKEN: I have trained my cherry trees so that I can almost pick a tree now ten years old without getting high up. They are very easily picked and are healthy, and that is a good way to have a cherry.

MR. MILCO: On the San Joaquin River, an Italian with forty acres of cherry trees, nearly all of which were dead, except a small lot where he had strawberries growing amongst them—these latter he had allowed to grow wild, as he had had no chance to get at them to trim them in consequence of his strawberry beds, which were about

five years old, while those he had trimmed, being exposed to the rays of the sun, were attacked and killed.

MR. CHAPIN: The subject of borers is intimately connected with the subject of pruning. It is well to have fruit trees branched low down to protect the tree from burning. The main points of the question have already been dwelt upon. The matter of locality and the peculiar currents of air in different regions are also worthy of attention, as showing the different effects of facilitating and retarding the borers.

In Santa Barbara County the trend of the coast is almost directly east, and the currents of air in the morning are from the east, and in the afternoon the wind is from the west. For some reason, possibly owing to the winds, they are never troubled there with borers, and their fruit trees there are grown high up. Noticing the peculiarity, I asked them why they grew trees so high up, and told them that if in Santa Clara they grew trees in that manner our orchards would be worthless. They told me they were never troubled with sunburning or with borers.

The general rule should be, in this country, that in dry sections the trees should be cut off and made to grow at eighteen or twenty inches from the ground, and in deciduous fruit trees not to exceed two feet, and then allow them to branch out, and the strong-growing branches should be headed back each year, and the tree should not be exposed too much to the rays of the sun until it gets a good, vigorous, healthy growth.

I have in my orchard some apricot trees, which, owing to the manner of planting, I was compelled to let branch out as they would, and, with proper pruning the following season, the best I could do was to keep them so that they branched out directly on the ground or very little above it, though with most I succeeded in getting them to branch out about six inches, leaving me a good solid trunk six inches high between the surface of the ground and the first large branch. A good many persons would say, "How are you going to cultivate?" I have no more difficulty in cultivating those trees than any others. The fruit can be gathered standing on the ground. My horses bring the cultivator as near to them as I want a cultivator to run to any trees, and without bruising the limbs. I generally trim back a tree when it is planted. Some prefer to leave the tree until the sap has started, not cutting it until the Spring, when the buds are ready to push out, and then it grows steadily along.

MR. COOKE: Before the close of this meeting I want to make the following report from Riverside District. They had a very fine Horticultural Convention:

Mr. Chairman and members of the Fruit-Growers' Convention:

The undersigned respectfully report that they attended the semi-annual Convention held at Riverside, March 16, 1883. There were a large assemblage of fruit growers at Riverside at the Citrus Fair. One afternoon and evening were given for the use of the horticultural meetings, which were largely attended. We respectfully acknowledge the courtesies extended to us by Messrs. A. S. White, Rudisill, Holt, McLeod, Bettner, and others, especially in affording us every opportunity to visit the many places of interest at Riverside and vicinity.

WM. H. JESSUP.
E. J. WICKSON.
A. T. HATCH.
MATTHEW COOKE.

MR. VESTAL: I would not like, by my silence, not to put myself on record with regard to cutting old cherry trees low down before the sap had started. I tried that, to my cost, on two hundred and fifty cherry trees. After that I took advice from a cherry grower who told me that if I would take the trees when the blossoms were just appearing I could cut the tree with safety, and I did it. I cut off six outside limbs as large as a man's arm, and reduced the heads and brought them down, and since that I grow up my trees, and let them throw out their branches as long and parallel to the ground as I can, and, with my larger experience, I do not think it is good policy to trim the outside limbs to grow *up* too much; it is better to reduce them, and keep them in subjection. I believe in tapering the trunk of the tree.

MR. JESSUP: I fully agree with Mr. Vestal. I believe the only way to get a good orchard tree is to give it a stout trunk, but I believe in keeping your tree down, and also in giving it a stout, healthy, vigorous body. I have seen the trees in San José at the Willows, and elsewhere, that were more of a shrub than a tree. In my locality, where the trees are healthy and strong, we can trim them without any injury about four feet high, at which height I allow the limbs to branch out, although, if I had raised the orchard myself, I should have started them lower down than that—about two and a half or three feet from the ground. I disapprove of the idea of raising bushes instead of trees, but I think the tree gets abundant protection by an expanse of top, and you have the benefit of the radiating heat of the earth.

MR. JOHNSTON: I think the sunburn on the tree is really the cause, and the borer is the effect. That has been my experience, and when the tree becomes diseased the borer finishes up the job, but I do not think the borer ever touches a healthy tree with vigorous flowing sap.

MR. CHAPIN: I do not think it is the object of any person to grow bushes instead of trees. The idea has been to grow a strong trunk all the while, and allow the trunk and main branches to grow to the greatest capacity, and cut the branches back and allow them to grow again. In that way we have just as much of a tree as though we had allowed it to grow so that a man would have to take a twenty-foot ladder to reach the lower limbs.

MR. AIKEN: I agree with Mr. Chapin, that a short strong body to a tree is desirable, and not a bush. This year my trees are pruned very low, but there is a strong healthy body growing in the center.

MR. VESTAL: A gentleman showed me a prune orchard of some sixty acres, and apricots in twenty or thirty acres, which had had a fine growth until this year, when they took the gum blight. The gum oozed out of the branches and trunk also. He was in San José and drove out to see me and asked me if I could give him any reason for it. I told him no, but my judgment was that it was on account of drought, and the moisture was exhausted, and the gum, through fermentation, was forced out of the tree.

PROFESSOR DWINELLE: I should like to examine the trees and the subsoil, but my impression is that what Mr. Vestal said is a full statement of the case. This has been a very trying year for trees, and I know places that are considered usually by no means deficient in moisture, where orchard owners were afraid they were going to lose

their trees, and, in fact, one man told me that he thought the early rain had saved his orchard. The hot weather in June hurt some trees very badly, and the season was exceedingly trying, and he described his trouble in the same way.

At Berkeley two men were raising some cherry trees and many of them died.

The currant borer has been spoken of, and the work of which becomes apparent when the hot sun strikes the leaves and the fruit and the weakened stem withers away, when a severe test is put upon its strength by the growth of the fruit. The borer is in a small chrysalis. It lies in the hole, with its head up towards the opening where it is going to come out by and by. The larva changes to a chrysalis, and the chrysalis at the lower end of its body has a little point that is free and moves around. Each one of the little rings at the lower end of the body has a little row of teeth, or little points, bending downwards. When it wants to get out it begins to "squirm" in this burrow. It is just wide enough to let it squirm a little, and the teeth, bending downwards, hold on to the side, so that it cannot get back, and so it wiggles itself out that way.

Dr. Chapin made the remark that he runs his cultivator as close to these trees as he wants to. I do not see how he could run a big plow, and, while I believe in breaking up the ground thoroughly before setting the orchard out, I do not believe in deep cultivation after that. I believe that the cultivator is not only the cheapest, but the best instrument that could be used. It thoroughly stirs the ground, and does not go deep enough to injure the roots, and it does not reach away up and interfere with the tree. There are a large number of devices similar to the one which we have on exhibition which can be successfully used.

On motion of DR. CHAPIN, a resolution of thanks of the Convention was tendered, as follows:

Resolved, That the thanks of the Fruit-Growers' Convention now in session be tendered to the Chamber of Commerce, through its Trustees, for their kindness in placing at our disposal their elegant hall, and also to the President, Vice-President, and officers of the Convention, for their services and earnest coöperation throughout the sessions of the Convention.

On motion of Vice-President JOHNSTON, it was unanimously agreed that a vote of thanks be tendered to the State Board of Horticulture for the valuable assistance rendered by them to this Convention during its session.

THE CHAIRMAN: Before adjourning, gentlemen, I would like to extend my thanks to the Convention for the honor conferred upon me in selecting me for the position which I have occupied. It seems to me that this Convention, judged from any standpoint, ought to be considered a success and a credit, not only to all of those engaged in the meetings of the Convention, but to the fruit interests of the State in general. I trust that, during the coming year, we will all be prospered in every way, and that in the Convention to be held one year from now we may have a well filled room, as I think we shall have.

On motion of MR. JOHNSTON, the Convention here adjourned.

TO THE FRUIT GROWERS OF CALIFORNIA.

[CIRCULAR SENT OUT DURING THE SUMMER AND THOUGHT BEST TO ANNEX TO THIS REPORT.]

The Executive Officer of the State Board of Horticulture hereby urgently requests the fruit growers of the State to observe and carefully carry out the following recommendations for the suppression and eradication of the various insect pests infesting fruit trees and fruit:

The means to be used for this purpose are now to be applied for the *Summer* or during the *active* and *fruiting stage* of the tree. Remedies intended for use during the *dormant* period of the tree will at another time be specified.

CODLIN MOTH.

The ground in an orchard should be kept thoroughly clean from weeds by constant cultivation, and the surface in as fine tilth as possible, and smooth, so as to avoid furnishing a hiding place for the larvæ of the moth. The bark of the tree should be as clean and smooth as possible in order to prevent the larvæ from hiding away from reach. All loose pieces of bark should be carefully removed without injury to the green layer and then destroyed, and the trunk washed with soft soapsuds or the "whale oil soap and sulphur mixture," in the strength of one pound to one and one half gallons of water. This preparation is a standard one, and is most convenient for use. It can be obtained from the manufacturers, Messrs. Allyne & White, 112, 114 Front Street, San Francisco, or it can be bought of, or ordered through, any merchant. Bands should be placed upon trees as follows: Strips of grain sacks, or other similar material, should be cut about six or eight inches in width and long enough to encircle the trunk of tree, lapping over slightly, and being folded, placed with the open edge downwards upon the trunk about one foot from the ground; a large headed tack (No. 12, tinned, being the best) will safely and easily confine the band in place. The upper or folded edge of the band should be tight upon the tree while the lower edges should be loose. *Once every week* these bands should be removed and all larvæ found in them killed. Once every week all fruit upon the trees should be carefully examined and the infested specimens picked, and then boiled and fed to the hogs; also all fallen fruit should be gathered from the ground once every week and be boiled and fed to the hogs. Where instead, it is used for drying purposes, all refuse should be carefully destroyed by boiling and feeding as above. This work should be commenced as soon as the fruit is

well set and of sufficient size to examine. Bands should be applied by the middle of May of each year. In addition to the bands, loose rags or pieces of sacking should be placed in the crotches of the trees and be scrupulously examined each week. The whole system must be carried out, until all fruit is finally gathered from the orchard. Fruit at gathering should not be piled up and left in the orchard. Great care should be exercised that no package infested with the eggs, larvæ, or pupæ of any insects be allowed to come upon orchard premises. It is important to see that where goods are purchased through commission houses they be ordered sent direct from place of purchase, as it is known that the eggs and larvæ of insects may be carried with other things than fruit packages. Where *new and free* packages are not used, all packages should be disinfected before being brought into the orchard, either at the distributing centers, or immediately upon their entrance upon the home premises. Even double disinfection would be found to be most profitable. Fruit growers are earnestly requested to examine into the merits of the *free* package system, as it is now believed that the day is near when the *free box or package* will be found to be the *cheapest* as well as the *safest* mode of marketing all fruit worthy the growing. The disinfection of packages may be accomplished by dipping and keeping them in boiling water (with or without the addition of an alkali), for the space of three minutes. By the faithful carrying out of these directions it is thought (and as proven by my own experience) that ninety per cent of an apple or pear crop can be saved instead of entailing that percentage of loss, as is frequently and usually the case where the moth is well established.

SCALE INSECTS.

At this season of the year the best remedy known at the present time is that of spraying infested trees and fruit thoroughly with the *whale oil soap and sulphur mixture*, in the strength of one pound to one gallon, or one pound to one and a half gallons water. This may be repeated. In this way the insects may be either entirely destroyed or held in check, and thoroughly treated the coming Winter by other and more suitable remedies for the dormant condition of the tree. (During the *Winter* season the proper treatment is by concentrated lye one pound, to water one and one half gallons, applied by fine spray. *This must not be applied in the Summer time.*) The necessity for careful watching and instant treatment of infested trees is paramount. Regarding the scale *Icerya Purchasi* a special report may ere long be expected. [Now to be found in this report, page 23.]

RED SPIDER.

The pest is best attacked after the egg has hatched and during the period of activity. At this time the whale oil soap and sulphur mixture, in the strength heretofore mentioned, and to which is added a very strong decoction of tobacco, is the most effectual yet used. It is hoped, however, that experiments now in progress with pyrethrum and other insecticides will furnish better and surer means for its extermination.

WOOLLY APHIS.

The positively effectual remedy for woolly aphis yet remains undiscovered. Particularly difficult is it to treat the aphis upon the roots of the tree. The means most effectual for those in the top of the tree is the spraying with a strong and hot decoction of tobacco leaves and stems; one pound to one gallon of water, then diluted by the addition of another gallon of water when used. It should be applied as nearly as may be at 130° temperature. Applied to the collar of the tree and just under ground, the following has been used with success in destroying the aphis upon the roots, or at least in preventing its appearance above ground: Five pounds or one half gallon whale oil; boil in two and one half gallons water; to this add one third of a pound of potash to make a soap. For use add to this quantity of soap one gallon of water and one and one half gallons of strong decoction of tobacco. Then to every five gallons of the wash thus made add one half a pint of Calvert's crude carbolic sheep dip. Apply by brush or spray, and then replace the earth mixed with a liberal quantity of air-slacked lime and wood ashes. Investigations to be made this season will doubtless add much to our knowledge of the best remedies for this pest.

GREEN APHIS.

This promises to be troublesome the present season. Until we ascertain better means, the most effectual remedy is the spraying by whale oil soap and sulphur mixture. Other species of the Aphides are noticeable on the apple, pear, plum, etc., and should receive similar treatment.

BORERS.

Preventive measures are far more successful than remedies after the injury has been done. Shading the trunk and preventing the sun burning the bark will almost always prevent the work of borers. This may be done by placing two shakes, one on the south, the other on the west side of the tree; or by means of two pieces of board nailed together and secured to the tree by rope. Also, allow the tree to branch out low down upon the trunk. Where borers have been at work, wrapping the trunk of the tree with burlap has been found to be a most valuable remedy. Rubbing the trunk of the tree near the ground with fresh common bar soap is very useful.

PEAR AND CHERRY SLUG.

The use of dust, or the finely powdered earth of the orchard, thrown freely over the tree by shovel or otherwise, is effectual in the destruction of this pest.

TENT CATERPILLAR.

The twigs around which are clustered a band of eggs should be cut off and destroyed during the Winter pruning. When, however, hatched out, the caterpillars should, while in the branches, be taken from the tree in the same way and burned; or when scattered about the tree they should be shaken off, and prevented from ascending the

tree trunk by placing upon the trunk a greased band, which they will not cross if the grease is kept soft. They then may be readily killed when collected in masses.

CANKER WORM (ANISOPTERYX VERNATA).

For the past three seasons this caterpillar has caused great damage to some orchards, but is not generally known through the State. The best means of combating it is to place about the trunk of the tree an inch rope, and over this a six-inch strip of tin, long enough to go around the tree and lap over a little, being secured by a nail driven through the tin and rope. The middle of the tin is placed lengthwise against the outside of the rope. This secures a space both above and below the rope between the band of tin and the tree. This proves an obstruction to the ascent of the tree by the wingless moth to deposit her eggs. Apply this band in the Autumn. Destroy bunches of eggs deposited on the trunk below; also, look on the underside of loose pieces of bark for eggs. When the worm is at work upon the tree and the foliage destroyed, there will be no crop of fruit matured. Then the effectual remedy is by spraying the tree with arsenic, one pound to one hundred or one hundred and fifty gallons of water.

Where arsenic has been used, three pounds to two hundred gallons of water, the past season, although burning the foliage at that time, it effectually destroyed the worm. The trees are in fine foliage and bearing a good crop of fruit at the present time.

The *parasitic fungi* (*fusicladium dendriticum*), so designated by Prof. T. J. Burrill, of Illinois, such as is manifest upon blighted and scabby apples and pears; also, the *smut fungus* (*fumago salicina*), observable upon oranges, olives, and the like, infested with scale, may be best treated by spraying trees and fruit with the whale oil soap and sulphur mixture, one pound to one and one half gallons of water.

In order to successfully combat these various pests, the hearty coöperation of all fruit growers is necessary, and it is hoped will be cheerfully rendered. County Horticultural Commissioners are reminded that the law creating those Commissioners is still in force, and that it will be necessary for them to carry on the work diligently the present season. Great caution should be used in sending specimens of insect pests over different parts of the State. Many pests are thus carelessly disseminated through the desire to show specimens. It is advised that no such specimens be sent by mail or otherwise, except to entomologists, or those whose business it is to carry on investigations therewith. When so sent they should be properly secured.

S. F. CHAPIN,
State Inspector of Fruit Pests.

SAN JOSÉ, May 17, 1883.

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FIRST ANNUAL REPORT
OF THE
STATE BOARD OF SILK CULTURE
OF
CALIFORNIA
FOR THE YEAR 1883.

OFFICE:
No. 40 California Street, Room No. 7, San Francisco, California.



SACRAMENTO:
STATE OFFICE, JAMES J. AYERS, SUPT. STATE PRINTING.
1884.

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FOR THE TERM OF TWO YEARS.

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W. B. EWER.....	414 Clay Street, San Francisco
R. J. TRUMBULL.....	419 Sansome Street, San Francisco

FOR THE TERM OF FOUR YEARS.

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MRS. T. H. HITTELL.....	No. 808 Turk Street, San Francisco
MRS. FLORA M. KIMBALL.....	National City, San Diego County
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FILATURE—Mrs. T. H. Hittell, Mrs. H. B. Williams; Honorary Members—Mrs. Governor Stoneman, Mrs. K. B. Felton, Mrs. P. T. Barclay.

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LIBRARY, AND PUBLICATIONS—The President, W. B. Ewer, Mrs. E. B. Barker.

OFFICE AND FILATURE.

The office of the Board is located at No. 40 California Street, San Francisco, Room 7. Open daily from 9 A. M. to 4 P. M.

The Filature for silk reeling is located at 534 Commercial Street, San Francisco, second floor. P. Consonno, Superintendent. Open daily from 9 A. M. to 4 P. M.

CORRESPONDENCE.

Correspondence relating to the specific work of any of the standing committees should be addressed to the Chairman of the committee to which it refers.

All other correspondence should be addressed to the "State Board of Silk Culture, 40 California Street, San Francisco, Room 7," where the Secretary may be consulted on matters relating to silk culture.

MEETINGS.

The Board meets at 40 California Street, for the transaction of business, on the last Thursday of every month, at 2 P. M.

The annual meeting occurs on the first Friday in November.

All meetings of the Board are open to the public.

AN ACT

TO ESTABLISH A STATE BOARD OF SILK CULTURE, AND TO PROVIDE MONEYS FOR THE EXPENSES THEREOF.

[Approved March 15, 1883.]

The People of the State of California, represented in Senate and Assembly, do enact as follows:

SECTION 1. There shall be established a State Board of Silk Culture, consisting of nine persons appointed by the Governor from the State at large, five at least of whom shall be members of the Ladies' Silk Culture Society of California.

SEC. 2. The members so appointed shall be specially qualified, by practical experience and study of the silk industry. Each member shall hold office for the term of four years, except those first appointed, four of whom, to be determined by lot, shall retire at the end of two years, when their successors shall be appointed by the Governor.

SEC. 3. The Board may appoint and prescribe the duties of a Secretary, and elect one of their own number Treasurer, both to hold office at the pleasure of the Board. The Treasurer shall give a bond to the State, approved by the Board, in the sum of ten thousand dollars for the faithful discharge of his or her duties.

SEC. 4. The Board may receive, manage, and use donations or bequests for promoting silk culture in this State. The Board shall establish, as soon as practicable, a Filature or Silk Reeling School in San Francisco, Sacramento, or Stockton, wherein free instruction shall be given in silk reeling.

SEC. 5. The Secretary, in addition to performing such official duties as the Board may direct, shall collect statistics and other information showing the condition and progress of sericulture throughout the State; correspond with various societies and individuals, both at home and abroad, who are engaged in the promotion of silk culture, and shall prepare a full report thereof, to be made to the Board annually for their publication; and shall receive for all such services a salary not to exceed one hundred dollars per month.

SEC. 6. The Board shall, biennially, in the month of January, report to the Legislature a detailed statement of its work. The report so made shall, under the direction of the Controller, be printed in pamphlet form, not to exceed fifty printed pages, and not to exceed two thousand copies thereof, to be distributed as the Board may direct. All printing required to be done by the Board for their official use, shall be done by the State Printer.

SEC. 7. The Treasurer shall hold all moneys of the Board, and pay out the same only on orders approved by the Board, and shall account therefor in his or her annual report.

SEC. 8. There is hereby appropriated for the use of the State Board of Silk Culture, as set forth in this Act, out of any moneys in the State Treasury not otherwise appropriated, the sum of five thousand dollars for the year commencing the first of April, eighteen hundred and eighty-three; and twenty-five hundred dollars for the year commencing the first of April, eighteen hundred and eighty-four; and the State Controller will draw his warrants upon the State Treasurer in favor of the Treasurer of the Board, as such officer, for the said sums, or any part thereof, when they become available, upon the proper demand of said Board.

SEC. 9. This Act shall take effect from and after its passage, and all Acts or parts of Acts in conflict with this Act are hereby repealed.

BY-LAWS OF THE CALIFORNIA STATE BOARD OF SILK CULTURE.

OFFICERS.

The officers shall be a President, three Vice-Presidents, a Secretary, and a Treasurer.

MEETINGS.

1. The Board shall meet monthly on the last Thursday of each month at 2 o'clock P. M.
2. The annual meeting shall be held on the first Friday in November, to consider the annual reports, and for the annual election of officers.
3. Special meetings may be held, to be called by the President upon the written request of any three members, provided three days notice be given for any such special meeting.
4. All meetings shall be open to the public, and five members present shall constitute a quorum for the transaction of business.
5. Occasional public meetings shall be held in different parts of the State under the direction of the Board, at which lectures and addresses shall be given for the information and instruction of the people on silk culture.

DUTIES OF OFFICERS.

1. *The President* shall preside at all meetings; sign the minutes in the record book, when duly approved; nominate all committees authorized by the Board; countersign all claims for money drawn by the Secretary upon the Treasurer, visit the office of the Board daily, or as often as practicable, to advise with the Secretary, and make himself familiar with the work of the Board in all its departments.
2. *The President and Treasurer* shall be ex officio members of the Executive Committee.
3. *The Secretary* shall keep a faithful record of all the proceedings of the Board, perform its correspondence, collect statistics and other information in relation to silk culture, showing the progress and condition of the industry in the State, correspond with societies and individuals engaged in promoting silk culture in California and elsewhere, prepare and read a digest of correspondence at each monthly meeting, prepare and submit to the Board an annual report and a biennial report for the Legislature of the State, draw all warrants upon the Treasurer, have charge of all official books, etc., belonging to the Board, require duplicate copies of all bills or demands upon the Board for the payment of money, keep a copy of all official letters sent out in the name of the Board, be in attendance at the office of the Board daily, between the hours of 9 A. M. and 4 P. M., except on Saturdays, when the office shall be closed at noon, and perform such other duties as may be required by the Board.
4. *The Treasurer* shall give a bond to the State, approved by the Board, in the sum of \$10,000 for the faithful performance of his duties; receive and hold all funds belonging to the Board; pay out money only upon warrants drawn by the Secretary and countersigned by the President; report the condition of the treasury at each monthly and annual meeting in writing; submit all books and vouchers to the Finance Committee for a monthly and annual examination, or to any other person or persons, whenever the President or the Board shall designate and request them to make such examination.
5. *A Superintendent of Filature* may be appointed by the Board whenever needed, and such other employes may be appointed as may be found necessary, their duties prescribed and their compensation determined.

STANDING COMMITTEES.

Standing committees shall be appointed as follows:

Finance Committee.
Executive Committee.
Cocoons, Eggs, and Trees.
Publications and Library.
Health Committee.
Filature or Reeling School.

Each of the standing committees shall consist of at least three persons, two of whom shall be members of the Board, and the others may be selected from the members of the California Silk Culture Association, or other competent persons, in order to secure in the way of advice the aid

of members of that association, or others interested in silk culture, for the promotion of the work committed to this Board.

The standing committees shall severally organize by selecting each its own Chairman and Secretary, arrange for stated meetings at the office of the Board, keep a record of all their transactions in books prepared for that purpose, and signed by their respective officers. Said record of proceedings of any standing committee shall be read at each stated meeting of the Board, and shall constitute its report to the same. The record books of the standing committees shall be kept at the office of the Board in charge of the Secretary.

DUTIES OF COMMITTEES.

1. *The Executive Committee* shall select rooms for the office, suitable for meetings, and for the transaction of the business by the Board; select qualified lecturers on special topics relating to the silk industry, and arrange for lectures to be given at stated, public, or annual meetings in San Francisco or elsewhere, arrange for silk culture exhibitions at State Fairs or elsewhere, consider and recommend suitable premiums to be awarded to successful silk culturists; have special charge of all business matters in connection with the Secretary, not otherwise provided for, and render all suitable aid to the Secretary.

2. *The Committee on Cocoons, Eggs, and Trees* shall, in connection with the Secretary, make provision for the purchase and distribution, by sale or otherwise, of mulberry seed, cuttings and trees, of such varieties as shall be approved by the Board, and of silkworm eggs, subject to the Health Committee's approval as to their unquestionable purity. They shall provide for careful experiments in different parts of the State, as to the comparative merit of different varieties of the silkworm and their proper food, and the cost of producing cocoons; they shall see that information is given to producers in regard to cocoeneries, the feeding of the silkworm, the treatment of the cocoons, and the preservation of silkworm eggs; and whenever occasion requires, and it is practicable to do so, they shall arrange to have some well qualified person visit those who are engaged in rearing silkworms, and who may need, for the time being, the direction of some practical silk culturist.

3. *The Committee on Finance* shall exercise a careful supervision of all funds, donations, and bequests belonging to the Board; they shall examine monthly all bills and books of accounts, and certify their approval; make monthly examination of the Treasurer's books, and see that all vouchers in his possession correspond with the several bills and resolutions on which warrants were ordered to be drawn.

4. *The Publication and Library Committee* shall arrange for whatever printing may be required by the Board, and prepare and issue occasional bulletins of information. The bulletins shall be dated, numbered consecutively, and be uniform as to size of type and page. The committee shall attend to the procuring of all books, stationery, and postage, and provide for a Silk Culture Library in which such books and works of reference shall be kept as the Board may approve for purchase.

5. *The Health Committee* shall obtain, by correspondence and personal investigation, information in regard to the condition of silkworms as to health. They shall give special attention to the subject of silkworm diseases, their cause and their cure, and the best means for preventing diseases. They shall also, by correspondence with silk producers and scientists, seek to obtain all possible information in regard to the improvement of the silkworm species, and take measures for securing the best varieties, so that the industry, so far as it depends upon information to be derived through this Board, may attain to the highest possible success.

6. *The Filature Committee* shall arrange for suitable rooms, furniture, and all needed appliances for the Filature, recommend suitable employes for the same, and arrange for its proper superintendence; and, in connection with the Committee on Cocoons, arrange for the purchase, examination, and care of cocoons and the price to be paid; they shall arrange for the proper care and sale of reeled silk; have general oversight of the operations of the Filature, the instruction it may furnish, and do all that may be needed for its efficiency and success.

7. No member of this Board, and no committee, shall contract any debt, unless authorized to do so by the Board.

ORDER OF BUSINESS.

1. Roll call.
2. Reading of Minutes.
3. Report of Secretary—Digest of Correspondence.
4. Report of Treasurer.
5. Report of Standing Committees.
 - First—Executive.
 - Second—Finance.
 - Third—Filature.
 - Fourth—Cocoons, Eggs, and Trees.
 - Fifth—Publications and Library.
 - Sixth—Health.
6. Reports of Special Committees.
7. New Business.
8. Addresses on Silk Industry.
9. Adjournment.

REPORT OF CHARLES A. BUCKBEE, PRESIDENT OF THE BOARD.

SAN FRANCISCO, December 31, 1883.

To his Excellency GEORGE STONEMAN, Governor of the State of California:

SIR: In accordance with the Act of the Legislature of the State of California, approved March 15, 1883, establishing "a State Board of Silk Culture," as President of said Board, I have the honor to submit for your consideration its first annual report.

ORGANIZATION OF THE BOARD.

Acting under your commission, dated April 19, 1883, the several members having duly qualified for the discharge of their duty, a meeting for organization was held in San Francisco, May 10, 1883. At this meeting officers were elected, rules for the conduct of business adopted, and necessary standing committees were appointed. The Board has met statedly every month since its organization. Two special meetings have also been held; and its first annual meeting, in accordance with its rules, took place Friday, November second. A full quorum of members has been present at every meeting. All have been prompt in attendance, except the two members residing in the southern part of the State. These, however, by their active labors in the Los Angeles and San Diego Districts, have done much to interest the people in behalf of silk culture.

NEWSPAPER REPORTS.

All meetings of the Board have been open to the public, and the members have acted in perfect harmony. Our transactions have been generously reported in the daily journals of San Francisco, and their notices have been extensively copied by other influential newspapers throughout the State. Editorials also have appeared in all the most influential journals of California, commending the industry of silk culture, for the sake of the increased wealth it will bring to the State, the employment it will furnish to the unemployed, and the comfort and happiness it is capable of conferring upon the people.

WORK OF THE STANDING COMMITTEES.

The standing committees of the Board have discharged the varied duties assigned to them with commendable zeal and fidelity. They have received valuable aid from others, who, on account of their patriotism, and knowledge in respect to some part of our work, have

been appointed members of the committees. Dr. Wm. P. Gibbons, of Alameda County, and Professor J. J. Rivers, of the University of California, by consenting to serve on the Health Committee, are giving to the State the results of their experience and learning, for which they are entitled to our unqualified thanks. Members of the California Silk Culture Association are rendering similar service in connection with the labors of other committees.

PUBLIC MEETINGS.

Public meetings on behalf of silk culture have been held at Redwood City, San Mateo County; St. Helena, Napa County; at the Harmon Ladies' Seminary in Berkeley; and in the City of Alameda. At all these meetings, illustrated lectures were given by the President of the Board, and much interest was developed in respect to this great industry.

SILK CULTURE AND PUBLIC SCHOOLS.

Hon. W. T. Welcker, State Superintendent of Public Instruction, has expressed his desire to do whatever may be consistent with our laws in respect to primary education, to make the benefits of silk culture understood and favored by teachers and pupils throughout the State. The Board has engaged to supply cuttings, trees, silkworm eggs, and manuals of instruction, for the benefit of our public schools, to all teachers who may have the approval of the State Superintendent and of the local School Boards. By encouraging teachers, with the favor of their local Boards, to plant mulberry trees around the school houses, the State Superintendent is making it possible for our boys and girls to be instructed in hours of recreation, in the first lessons of silk culture. Thus many in our public schools, without interfering with their prescribed school work, may be educated in a way that will enable them to become profitably industrious when their school days are ended.

IMPORTANCE OF TECHNICAL EDUCATION.

The importance of technical education in public schools is becoming more and more apparent. Mr. Charles G. Leland, in an address before the National Education Association, at its meeting in Washington, February, 1882, calls attention to Circular No. 4, issued by the Bureau of Education, in which the importance of education in industrial arts in schools is forcibly presented. Mr. Leland says there is "an enormous and rapidly growing demand for hand-made objects. This demand for hand-made art will, ere long, give employment to that very large class whom it is at present difficult to fit for anything. If there were to-day as much knowledge of and fondness for design as there seems to have been among the prehistoric savages of Europe, we would, in a few years, raise our manufactures of every kind to a preëminence, and with them improve ourselves personally, morally, and socially." How few remunerative employments are open to our daughters, when school days are over. Silk culture, and other industries connected with it, would give multitudes of them healthful occupation throughout the year. "It is a fact," says Mr. Leland, "that when a girl masters an art, she generally remains true to it, and makes the most of it. Its practice gives a certain sense of

superiority and self-reliance which goes far to strengthen morals in the truest sense of the word. By making hand-work a part of every child's education we shall destroy the prejudice against work as being itself vulgar."

THE ANNUAL MEETING.

The first annual meeting of the Board was held November second. In connection with this meeting, the Filature was formally opened to the public, and an exhibit was made of the silk industry of the State, comprising the reeled and spooled silk of the Board, the fabrics of Carlson & Currier, of San Francisco, and the silk dress goods of Saufrignon & Co., of San José. Addresses were made by C. A. Buckbee, President of the Board, Edward Carlson, Esq., of San Francisco, and by his Excellency, George Stoneman, Governor of the State, who expressed the hope that this industry might become one of importance—a partial answer to the question, "What shall we do with our girls?"—and a useful occupation for inmates of the charitable and reformatory institutions of the State, making it possible for them to pay, in part, at least, for their maintenance. Mrs. Governor Stoneman, also, kindly consented to read the report of the committee awarding one hundred and seventy-five dollars in ten premiums to the most successful producers of silk cocoons in California for the year 1883. There were twenty-seven competitors, representing fifteen counties. Five of the successful competitors were boys and girls from ten to fourteen years of age. Some of the cocoons gave the extraordinary yield of five and a half ounces of silk from one pound of cocoons.

THE STATE FILATURE ESTABLISHED.

The Filature and Silk Reeling School began operations in August, under the superintendence of Mr. Paul Consonno, with Mrs. Josephine Soldavini as reeler, and Paul Rusconi as helper. For the use of beginners one hand-reel was purchased from Philadelphia. For advanced pupils and expert reelers, a double steam-reel was placed at our disposal by the California Silk Culture Association. These reels have been in constant operation since August, and it will be necessary to keep them running until near the close of March in order to extract the silk from the cocoons on hand. The work could all have been done by December if we had employed only expert reelers; but the duty of educating girls in the art of reeling necessarily retards the work. Instruction has been given to eleven young women, who have made excellent progress, most of them being able now to reel nearly three ounces in seven hours. In two months more, I am assured by the Superintendent that they can produce four ounces in eight hours. Next year they can all be employed as independent reelers or teachers, and should receive some reasonable compensation for their work, according to the amount of silk they may produce. They can also be of great service to the State as teachers, in other Filatures that may hereafter be established, and in charitable institutions whose inmates will soon need to be taught the art of silk reeling.

IMPORTANCE OF THE FILATURE.

The importance of the Filature became instantly apparent. Silk culturists from all parts of the State began at once to realize its advan-

tages. Producers sent in their cocoons in lots varying from one half pound to nearly two hundred pounds, and were paid for them in cash at the most favorable valuation. The amount received at the Filature, and the product of others, raised for the purpose of supplying eggs to foreign markets, cannot have been less than fifteen hundred pounds. The cocoons paid for at the Filature were valued at \$466 84.

LABORS OF STANDING COMMITTEES.

The Standing Committee on the Filature deserves special mention. Its members have visited the institution almost daily since it was first opened, aiding the Superintendent, cheering the pupils, and watching the work of the establishment with as much care as a merchant would give to his own private business. The work of all the committees and members of the Board is, in fact, a labor of love. Not one of them receives any salary, or any pecuniary benefit whatever. Their service, however, is cheerfully given in the patriotic desire to make silk culture a leading industry in California homes, for the sake of the employment it may yet give to tens of thousands of our people in all coming time.

CORRESPONDENCE—WOMEN SEEKING WORK.

An examination of our correspondence discloses a fact of great encouragement. It is evident that hundreds of parents, mostly mothers, many young women, and many teachers, have determined to enter upon this industry, as an employment for themselves and their children. Our information from France, Italy, Hungary, and other silk-growing countries, shows that millions of women in the world are largely dependent upon silk culture for their support, and that it is light, pleasant, and well adapted to employ women and young persons in their own homes.

FEW EMPLOYMENTS OPEN FOR WOMEN.

The lack of appropriate industrial pursuits for women in our country is well known; and it would seem to be a paramount duty for a wise government to remedy this evil, as far as possible. The well known Professor Adler, in a recent address in New York, called attention to the heroic struggle of a poor woman in Jersey City, who was making shirts for a living, for a New York house, at twenty-two cents a dozen. Compelled to cross the ferry, and deliver her work when completed to her employers, she had left for her labor only eighteen cents! It will be a sad day for California if its women and girls are ever brought to such a struggle for bread!

DUTY OF THE STATE TO DEVELOP INDUSTRIES.

It is largely in the power of the State to prevent such a calamity by developing all the industries which may be made to prosper here, on account of our unusually bountiful soil and unequalled climate. It is much better for the State to build up such an industry as silk culture, for the sake of its future mothers and daughters, than by its neglect, to shut them up to idleness, starvation wages, poverty, the public charity, enforced crime, and social ruin.

SILK CULTURE STATION NEEDED.

The establishment of a silk culture station is a subject that has occupied most serious attention. Such a station, conveniently located, would be of great benefit to the State, and in fact to the entire Pacific Coast. The best varieties of mulberry trees could be cultivated; the best known seed for silkworms could be improved, the most economical methods of rearing silkworms and treating their cocoons, could be illustrated, and from its own product, seeds, cuttings, trees, and eggs of the most perfect kind could be distributed. A few weeks spent at such an institution would enable beginners to enter upon the industry at their homes intelligently.

CONGRESS SHOULD AID SILK CULTURE.

The importance of such a station for the benefit of silk culture has already been urged upon Congress for the sake of its advantages to the people of the United States. Stations of this kind at Washington, Philadelphia, in the Carolinas, in Mississippi, Kansas, and California, would soon be worth millions of dollars to the country. The future of silk culture could be no longer in doubt in our land.

OTHER GOVERNMENTS AID THIS INDUSTRY.

All countries where this industry has become established, have been compelled to foster it in its infancy. France did so for a long time; now it is reaping rich rewards; for in silk reeling alone, employment is furnished to not less than fifty thousand women and girls. Hungary has recently established its Filature and silk culture station. The Commissioner of that country reports that the product for 1881, was fourfold greater than the product of 1880. Even in Japan, whose people are earning forty million dollars a year in silk culture, the Government has its Filature, and in other ways helps the people to help themselves, by its fostering care of this great national industry.

MULBERRY TREES IN THE STATE.

Some progress has been made towards obtaining statistics in respect to the number, condition, and location of mulberry trees in the State. County Assessors and others have been urged to assist in the effort. It is desirable to know the names of owners of these invaluable trees, the places where they are grown, and their age and condition. Inquiries to this end will be continued until the census shall be as complete as possible. The information already obtained is given in the special report on the subject by one of the Commissioners, Mrs. E. B. Barker.

PREVENTION OF SILKWORM DISEASES.

The Board has taken measures to prevent the distribution of diseased silkworm eggs among the people. Through the efforts of the United States Consuls and others, it has obtained a supply of the best known varieties of eggs from Japan, Italy, and France, for the use of our culturists during 1884. Before distribution these eggs are carefully inspected by Professor Hilgard and Professor Rivers, of the

University of California, and Dr. Wm. P. Gibbons, of the Health Committee, and these gentlemen are authorized, if they find it necessary, to employ other scientific persons to test the purity of the seed before it is distributed. I am satisfied that equal care is taken to supply the best and purest seed to our culturists by Professor Gillet, of Nevada City, and Mr. J. A. Garbarini, of Jackson, Amador County, who have both been successful for some time in raising choice eggs for foreign purchasers.

STATE FAIR SILK CULTURE EXHIBITS.

An exhibit of silk cocoons and reeling was made at the last State Fair in Sacramento, and at the San Joaquin Valley Fair in Stockton. The Record-Union, of Sacramento, in its remarks on the exhibit, declared it to be "one of the most attractive features of the pavilion." Of the exhibit at Stockton, both the Herald and the Independent were generous in their references to it. One of these journals says: "The center of attraction was the Filature or silk reeling machines." We were anxious to make exhibits at all the district fairs in the State, and only the lack of funds prevented us. Such practical illustrations of the industry are an economical and effective method of educating the people. In some way, I hope that means may be provided for exhibits in the future at every district fair, until our agriculturists will come to know the value of silk culture, and make it one of their home industries.

THE WORK FOR 1884 NEEDS A LARGER APPROPRIATION.

The prospects for the coming year are very encouraging. A good increase in the silk product of the State is certain; and I am confident that six or eight additional steam reels for the Filature will be needed. The institution should resume operations not later than June first. We will then need a storeroom for cocoons, a reeling room, a drying and storeroom for the reeled silk, and another room for the Secretary and meetings of the Board. To pay for these accommodations and carry forward the good-begun work, a much larger sum will be needed than what is now at our disposal. How to secure the money absolutely required, over and above the two thousand five hundred dollars placed to our credit by the Legislature, is a serious problem. If wealthy and patriotic persons in California only knew what blessings it is in their power to confer upon our State and country by a generous gift to this Board, the problem would be solved.

THE INDUSTRIAL PROBLEM AND SILK CULTURE.

One great advantage in silk culture, which I desire to impress upon your Excellency, is its partial solution of the labor problem in California, where there are peculiar phases of the subject. It will certainly help to round out the year with a succession of industrial pursuits. Silk culture, in respect to time, comes earliest in the range of agricultural pursuits. As soon as the young leaf appears on the tree the work begins. In six weeks the work is done. A few days more will serve to dry and ship the cocoons to the Filature. Not until this is all done does the season arrive for gathering and marketing fruit. Then follows the canning season, and after this we reach the

period for gathering our rich yield of grapes. But when this is all done we have now scarcely anything left for our girls and boys to do. The above employments ought all to engage their energies, each in its season. We should claim it as our birthright instead of allowing it to be done by the Chinese, who have no interest in our civilization and no love for our homes. When, however, we have raised our silk, gathered and canned our fruits, and harvested our grapes, there are no employments to engage our hands from November until the following May.

WORK FOR BOYS AND GIRLS THROUGHOUT THE YEAR.

It is just here that the silk industry, when once established, will furnish beautiful employment for thousands of our youth in town and country. The Filature can give employment all the year round. With such institutions established at Sacramento, Stockton, San José, Los Angeles, San Diego, and other places, as they must be, when our citizens produce a tenth part of what can easily be grown, there will be work for tens of thousands of our sons and daughters, from the beginning to the close of the year.

FINANCE.

The reports of the Treasurer and the Finance Committee will illustrate with what economy the Board has endeavored to administer the trust which your Excellency committed to our care. Of the five thousand dollars placed to our credit, for the year ending April 1, 1884, we have expended \$3,881 15. For the remaining three months, the expenses are estimated as follows:

Salary of Secretary.....	\$217 50
Rent of office, postage, etc.....	75 00
Salary of Superintendent.....	225 00
Wages of reeler and helper.....	135 00
Rent of Filature, water, steam, etc.....	132 50
Towards purchase of eight steam reels.....	333 85
Amount already expended.....	3,881 15
Total	\$5,000 00

For your further information, I have the honor to submit the accompanying report of the Secretary, reports of committees, special reports, and other papers and addresses, all of them of value in illustrating the work accomplished by the Board.

Very respectfully,

C. A. BUCKBEE,
President.

ANNUAL REPORT OF THE SECRETARY OF THE STATE BOARD OF SILK CULTURE.

In accordance with an Act of Legislature, approved March 15, 1883, printed in the preceding pages of this report, His Excellency Governor George Stoneman, appointed the California State Board of Silk Commissioners. Their names and addresses are given on page two.

The first session of the State Board was held May 10, 1883, at 808 Turk Street, at which time the long-term members were duly balloted for and declared. The By-laws and Order of Business prepared and submitted by the committee and adopted, with subsequent amendments, are as follows. [See page four.]

The Board then proceeded to the election of officers to serve until the annual meeting in November, with the following result: President, C. A. Buckbee; Vice-President, Prof. E. W. Hilgard; Secretary, Mrs. E. P. Keeney; Treasurer, R. J. Trumbull.

RESOLUTIONS.

The following resolutions were unanimously adopted:

Resolved, That the California State Board of Silk Culture will purchase and pay cash, at the highest market value, for all cocoons that may be offered, whether now on hand, or raised by silk producers in the State during the current year, for the use of the Filature.

Resolved, That a Filature, or reeling school, be established, and a superintendent of the same be appointed as soon as may be necessary, in order that applicants may be instructed in the details of the business. The idea being to encourage the prosecution of the silk industry throughout the State.

Resolved, That the Executive Committee are authorized to engage rooms for the office, not to exceed \$20 per month, and to procure the necessary furniture for the same; also to procure books and stationery.

SPECIAL MEETING MAY TWENTY-SECOND.

A special meeting of the Board was held May twenty-second, for the consideration of silkworm diseases, and other important subjects. Two thousand copies of Bulletin No. 1 were ordered printed.

Mrs. T. H. Hittell was appointed to make inquiries on the condition of the silk industry in foreign countries.

SECOND REGULAR MONTHLY MEETING.

The second meeting of the Board was held June first, at which it was determined that prizes to the amount of \$170 be awarded for the best cocoons raised in the State during the year.

Mrs. Flora M. Kimball was requested to institute measures in Southern California for the further promotion of silk culture. The progress made in that section is shown in her published report. Sub-

jects were selected for addresses to be delivered June first, July sixth, August third, and September seventh, by W. B. Ewer, Mrs. T. H. Hittell, Dr. C. A. Buckbee, and Professor E. W. Hilgard, in the order named. An order was made for the purchase of sixty dollars' worth of the best eggs to be obtained in Europe and Japan.

THIRD MONTHLY MEETING.

At the third meeting of the Board, July sixth, a number of visitors were present and took part in the discussions. Dr. C. A. Buckbee, and W. B. Ewer, and others, were requested to visit Berkeley and St. Helena to address the people, and give such instruction as would best promote the industry in those sections. Dr. H. H. Behr was also invited to deliver an address before the State Board on "Silk Producing Insects." Premiums for cocoons raised by children under seventeen years of age, were offered to encourage "home industry." At the close of this meeting, Dr. Buckbee delivered a short lecture on the "History of Silk Culture in the United States," which is printed elsewhere in this report.

A special prize of \$5, given by "A Friend," was announced by the Secretary, Mrs. Keeney, to be awarded to any boy or girl for the best cocoons raised in 1883, in addition to the prizes offered by the Board.

FOURTH MONTHLY MEETING.

The fourth session of the Board took place August third, at which time the establishment of the Filature was inaugurated, to be conducted as a technical school for perfecting those who were interested in the mode of reeling. Paul Consonno was elected Superintendent, at a salary of seventy-five dollars per month.

Mrs. E. B. Barker read a valuable paper on "Mulberry Trees in this State," followed by the report of the Health Committee, and an address by Dr. C. A. Buckbee, which was ordered published.

FIFTH MONTHLY MEETING.

At this meeting, September seventh, it was voted to make an exhibit at the State Fair, representing the silk industry, which resulted in a most satisfactory display, as shown by Mrs. Rienzi's report at the time. This exhibit was also renewed at the Stockton Fair, and at the Mechanics' Fair in this city, attracting the attention of thousands to the silk industry.

The Executive Committee also reported well attended lectures given at St. Helena and Berkeley in the interest of silk culture, by President Buckbee.

The Filature Committee reported satisfactory progress in reeling silk, and recommended that samples be placed on exhibition at the Berkeley Museum and various other places.

Interesting reports were read by Mrs. T. H. Hittell, Mr. Paul Consonno, and others. Mr. Consonno called particular attention to the strength, grain, and elasticity of the fiber of California silk, and recommended that a training school be established at some central locality in the State for the purpose of teaching the best methods of raising the silkworm and preventing disastrous mistakes, which are likely to occur from lack of knowledge on the subject at the com-

mencement. Realizing the necessity of a thorough understanding for the achievement of the best results in silk culture, particularly in its incipency, the California Silk Culture Association, in pursuance of this suggestion from a thoroughly experienced sericulturist, has already framed a memorial and drawn up a bill in accordance therewith, to be presented to the present Congress, appealing for aid to establish four experimental stations, one of which shall be located in this State. It is to be hoped that California's representatives, as well as those from other States, will realize the importance of this great national industry, and that they will act wisely and promptly in its behalf.

SIXTH MONTHLY MEETING.

The sixth regular meeting of the Board occurred October fifth. A letter from Felix Gillet, of Nevada City, was read, which gave much valuable information in regard to the various kinds of mulberry trees, leaves, and other food for silkworms.

A letter was also read from Professor W. T. Welcker, State Superintendent of Public Schools, relative to introducing the silk industry into public schools of the State. This letter gave rise to an interesting discussion, the weight being principally and wisely in favor of the proposition.

A letter was read from Messrs. Saufrignon & Van de Castele, silk manufacturers of San José, urging the coöperation of the friends of the silk industry in promoting the interests of silk culture by creating a demand for the silk goods manufactured in this State. This suggestion will undoubtedly be heeded by all thoughtful and patriotic women, when the fact becomes generally known that California manufactured silks are entitled to take rank with other manufactures, owing to the superiority of the silk fiber and purity of the dye, and consequently the greater durability of the fabric.

The Secretary, Mrs. E. P. Keeney, stated that a large correspondence had been conducted during the month, showing an increasing interest in the industry.

At the suggestion of the President, a printed programme was ordered prepared and distributed for the next monthly and the annual meeting.

Mrs. Louise Rienzi made a full report of the silk exhibit at the State Fair, stating that Mrs. Laura de Force Gordon rendered valuable assistance; that the Stockton Fair requested a transfer of the same to that city, and made an award of fifty dollars to the Silk Culture Association.

The Board decided not to purchase cocoons raised in other States, as the funds would not warrant it to do so, and the capacity of the present Filature would be fully taxed to utilize the home product.

The propriety of obtaining sample cocoons from other States for comparison, was suggested by Professor Hilgard, with the view of demonstrating the probability of producing healthier as well as superior cocoons. This experiment, once successfully proven, would establish a market for the finer quality of eggs in France and Italy, where the supply is deficient.

Professor W. T. Welcker being present, the objects of the Board were more fully explained by short addresses from members, who stated in substance that the chief aim, and the one most to be desired by promoters of the silk industry, was to provide a suitable and

remunerative employment for women and children. The Superintendent of Public Instruction was recommended to encourage the planting of mulberry trees around school houses throughout the State, and to advise teachers to instruct their pupils during recreation hours at least, in raising silkworms.

The purchase of eight additional reels for the Filature was duly considered and deemed necessary, in order to handle the increase in the cocoon product the ensuing year.

FIRST ANNUAL MEETING.

The first annual meeting was held in the assembly hall of the Board, No. 40 California Street, November 2, 1883, at two o'clock, p. m.

The annual reports of the officers of the Board and Commissioners, as well as numerous papers by earnest and zealous promoters of silk culture, were submitted, and will be found indexed in this work.

The officers and committees for the ensuing year were duly elected, as they appear on the second page. At the

EVENING SESSION

Which took place in Dashaway Hall, a very creditable display of the silk industry of California was made.

The President, in his annual address, discussed the history of the State Board of Silk Culture, plainly pointing out how the wives and daughters of the land might easily add to the family income by planting the mulberry and raising cocoons, and at the same time pave the way for a higher moral and intellectual plane, by instilling into the minds of the youth habits of a profitable, pleasant, and instructive industry.

Mr. Edward Carlson followed in an address on silk manufacturing in California. During the course of his remarks, he stated that the quality of the State product was very fine, so far as he had tested it, and ere many years, the silk industry should give employment to a multitude of boys and girls.

Governor Stoneman made some happy remarks. His observations had convinced him that the last Legislature acted wisely in making an appropriation to encourage silk culture, concluding with a humorous account of his own experience in the business, which was a failure; but could only be attributed to his having had little or no previous knowledge of the industry, and the absence of a market for his product.

Mrs. Governor Stoneman, on behalf of the Committee on Awards, read their report, which is given elsewhere.

EIGHTH MONTHLY MEETING.

The eighth and last regular monthly meeting of the Board, ending the first year, took place December seventh.

After the transaction of the routine business, a paper on the proper method of growing the mulberry, with illustrations, prepared by Mrs. T. H. Hittell, was read, and will be found in the body of this report.

With this meeting, the first year's work of the California State Board of Silk Culture closed. How vigorously and well the work has been prosecuted, the coming months of the current year will tes-

tify. The large amount of correspondence, embracing nearly every county in the State, and widening to all parts of the Union, show the feeling of interest being manifested in the movement. This, coupled with the fact that the advancement being made is slow, is certainly indicative of a healthy growth; and we hope that no disastrous reverses will be met in the future of silk culture.

The fact that corporations cannot successfully control the industry speaks volumes for the ultimate achievement of the Board's grandest aims—the creation of a field of usefulness, the noble purpose of which is the amelioration and elevation of the laborer.

More might be said in behalf of this most laudable movement did not space forbid. Much indispensable knowledge, however, can be gleaned from the subjoined reports and papers, and it is hoped and believed they will fill a void sadly felt and needed: that of furnishing necessary and practical knowledge to the beginner in the work. With the strong assurance that the facts contained herein will materially accomplish that desired result, we cheerfully submit the record of our work for the year 1883.

Respectfully,

MRS. S. A. RAYMOND,
Secretary State Board Silk Culture.

REPORT OF COMMITTEE ON FINANCE.

The Committee on Finance have met regularly every month. They have examined separately, bills which in the aggregate amount to three thousand eight hundred and eighty one and fifteen one hundredths dollars, which the committee has recommended to the Board for approval. Bills for the same have been approved by the State Board of Examiners, for which warrants upon the State Treasurer have been issued by the State Controller and placed in the hands of the Treasurer, to enable him to make settlement with the individual claimants. The classification of expenditures from May 10 to December 31, 1883, is as follows:

GENERAL AND OFFICE EXPENSES.

Rent of office	\$120 00	
Furniture and fixtures	369 82	
Secretary and assistance	595 13	
Stationery and books	91 50	
Exhibits at Sacramento and Stockton	271 10	
Premiums to silk culturists	170 00	
Rent of hall for annual meeting	31 00	
Postage, expressage, fuel, etc.	188 00	
		\$1,836 55

FILATURE EXPENSES.

Rent, steam, and water	\$197 50	
Machinery, plumbing, and fixtures	399 47	
Salary of Superintendent	412 50	
Wages of reeler and helper	263 02	
Paid on account of cocoons	466 84	
Paid for silkworm eggs	151 60	
Mulberry trees and cuttings	61 07	
Expenses of spooling reeled silk	34 00	
Incidental expenses of Filature	58 60	
		2,044 60

Total	\$3,881 15
The appropriation from the Legislature is	5,000 00
Balance to the credit of the Board	\$1,118 85

TREASURER'S ACCOUNTS.

From the books and accounts of the Treasurer, R. J. Trumbull, from May 10 to November 2, 1883, and his successor in office, W. B. Ewer, from November second to December thirty-first, we are enabled to present the following itemized statement. Each bill, duly approved by the Board and paid to the respective claimant, has been examined by the committee, and found to be correct, as follows:

BILLS INCURRED AND PAID TO DECEMBER 31, 1883.

BILL.	NAME OF CLAIMANT.	Description of Bills.	Amount.
1	Mrs. E. P. Keeney, Secretary	Salary	\$52 63
3	Mrs. E. P. Keeney, Secretary	Postage and expressage	53 53
4	Frank G. Edwards	Furniture for office	132 52
5	Cunningham, Curtis & Co.	Stationery	77 85
6	Holbrook, Merrill & Stetson	Stove and fixtures	20 00
7	L. & E. Emanuel	Furniture for office	77 00
8	T. D. Cromz	Repairing office desk	4 00
9	J. Vollmar	Furniture for office	18 00
10	Sanborn, Vail & Co.	Frame, Filature furniture	3 60
11	Wangenheim, Sternheim & Co.	Cocoon jars	7 67
12	Wm. C. Wyckoff	Books for library	5 00
13	Mrs. E. P. Keeney, Secretary	Salary	75 00
14	Frank Keeney	Assistance at the office	10 00
15	West Coast Furniture Man'g Co.	Office furniture	54 00
16	R. J. Trumbull, Treasurer	Cocoons	125 00
17	Mrs. E. P. Keeney, Secretary	Postage and expressage	13 77
18	Mrs. E. B. Barker	Furniture for office	6 00
19	Dewey & Co.	Expressage on cocoons	5 75
20	American Silk Culturist	Books for library	3 50
21	Davis Brothers	Office furniture	2 50
22	H. S. Crocker & Co.	Multiplex letter press	3 25
23	F. S. Chadburne	Office furniture	35 00
24	Mrs. E. P. Keeney, Secretary	Salary	75 00
25	Mrs. E. P. Keeney, Secretary	Postage and expressage	14 34
26	The Grangers' Bank	Rent of office	45 00
27	Committee on Cocoons	Help in sorting cocoons	10 50
28	Renton Coal Company	Coal for office	1 40
29	Holbrook, Merrill & Stetson	Coal scuttle for office	70
30	Wm. Little	Wood and coal box for office	5 50
31	Frank G. Edwards	Oilcloth for office	1 00
32	R. J. Trumbull, Treasurer	Cocoons	144 25
33	C. A. Buckbee, President	Silkworm eggs	25 00
34	L. & E. Emanuel	Office furniture	5 00
35	N. Y. Silk Exchange	Silk Culture Magazine	1 00
36	Mrs. T. H. Hittell	Silkworm eggs	35 00
37	Mrs. E. P. Keeney, Secretary	Salary	75 00
38	J. O'Connell	Lettering office door	5 00
39	N. P. Cole & Co.	Furniture for Filature	52 50
40	Com. Steam Power Works	Steam for Filature	15 00
41	Alex. Mackay	Furniture for Filature	90 80
42	Woman's Silk Culture Association	Hand reel for Filature	20 00
43	Mrs. S. A. Raymond, Treasurer	Filature furnishing	29 90
44	Mrs. E. P. Keeney, Secretary	Postage and expressage	19 33
45	R. J. Trumbull, Treasurer	Sundry Filature expenses	29 80
46	Bertin & Lepoeri	Rent of Filature and water	52 50
47	C. A. Buckbee, President	Postage, expressage, etc.	11 62
48	Paul Consonno, Superintendent	Salary	113 50
49	Josephine Soldavini	Wages as reeler	32 50
50	B. F. Sterrett	Ten thousand spool labels	20 00
51	Galli & Co.	Machinery for Filature	140 00
52	J. Caire	Silk scales for Filature	10 00
53	Cunningham, Curtis & Welch	Illustrations of silk weighing	90
54	August Pistolisi	Alcohol and benzine	1 90
55	Swan, the painter	Cloth sign	2 50
56	Mrs. J. E. McEwen	Boxes for spooled silk	1 50
57	Wempe Brothers	Boxes for spooled silk	12 50
58	B. F. Sterrett	Display cards for fairs	4 00
59	Mrs. S. A. Raymond	Expenses of State Fair exhibit	51 50
60	Mrs. S. A. Raymond	Trees distributed, postage, etc.	61 07
61	Mrs. S. A. Raymond	Cocoons, etc.	80 60
62	Wangenheim, Sternheim & Co.	Cocoon jars	4 00
63	Bertin & Lepoeri	Rent of Filature and water	27 50
64	C. A. Buckbee, President	Telegrams, drayage, etc.	3 41
65	Mrs. L. D. F. Gordon	San Joaquin Valley Fair exhibit	68 80
66	Paul Ruseoni	Helper in Filature	22 50
67	Paul Consonno, Superintendent	Salary and drayage	75 50
68	Mrs. E. P. Keeney, Secretary	Postage, expressage, etc.	14 23

Bill.	NAME OF CLAIMANT.	Description of Bills.	Amount.
69	Mrs. E. P. Keeney, Secretary	Salary	\$75 00
70	Mrs. H. B. Williams	Sundries for fair exhibits	1 50
71	Paul Consonno, Superintendent	Expenses for exhibit at State Fair	54 70
72	Josephine Soldavini	Wages as reeler	31 25
73	R. J. Trumbull, Treasurer	For premiums for cocoons (1883)	170 00
74	Bertin & Lepoeri	Rent of Filature and water	27 50
75	Paul Consonno, Superintendent	Salary	75 00
76	Josephine Soldavini	Wages as reeler	36 25
77	Paul Rusconi	Wages as helper	21 66
78	Shepard Brothers	Plumbing at Filature	29 90
79	Shepard Brothers	Plumbing at Filature	24 10
80	Com. Steam Power Works	Steam at Filature	20 00
81	Joseph Gamboni	Removing refuse	3 50
82	Mrs. H. B. Williams	Curtains for Filature	1 15
83	Wangenheim, Sternheim & Co.	Cocoon jars	1 50
84	Mrs. E. P. Keeney, Secretary	Salary	75 00
85	Mrs. E. P. Keeney, Secretary	Postage, traveling expenses, etc.	24 55
86	C. A. Buckbee, President	Telegrams, postage, etc.	6 42
87	S. McBirney	Rent of Dashaway Hall, anniversary	31 00
88	The Grangers' Bank	Rent of office	75 00
89	Mrs. E. P. Keeney, Secretary	Salary to November 3	7 50
90	Mrs. E. B. Barker	Cocoons and expressage	180 41
91	Mrs. S. A. Raymond, Secretary	Salary	75 00
92	Mrs. S. A. Raymond, Secretary	Expressage and postage	6 25
93	Paul Consonno, Superintendent	Salary	75 00
94	Paul Consonno, Superintendent	Expenses to Brentwood	5 50
95	J. J. Bruni	Removal of refuse	1 00
96	Paul Rusconi, helper	Wages at Filature	21 66
97	R. J. Trumbull, Treasurer	Sundry Filature expenses	13 40
98	A. Getz	Painting at Filature	7 50
99	Bertin & Lepoeri	Rent of Filature and water	27 50
100	A. Denari	Hardware for Filature	1 60
101	J. Meissner	Carpenter work at Filature	5 00
102	Josephine Soldavini	Wages as reeler	32 50
103	Galli & Co.	Machine work at Filature	17 25
104	Paul Consonno, Superintendent	Sundry supplies at Filature	11 00
105	Mrs. E. B. Barker	Cocoons purchased	11 43
106	Mrs. S. A. Raymond, Secretary	Salary	75 00
107	Mrs. S. A. Raymond, Secretary	Fuel, postage, expressage, etc.	13 65
108	Bertin & Lepoeri	Rent of Filature and water	27 50
109	Shepard Brothers	Plumbing at Filature	16 50
110	H. J. Huick	Supplies at Filature	2 50
111	Paul Consonno, Superintendent	Salary	75 00
112	Paul Consonno, Superintendent	Silkworm eggs and expressage	32 20
113	Paul Rusconi	Wages as helper	21 70
114	Josephine Soldavini	Wages as reeler	32 50
115	J. Bruni	Removal of refuse	1 00
Total expenses to December 31, 1884.			\$3,881 15

To this statement the Finance Committee append the report of Mr. R. J. Trumbull, containing a classified account of expenses, as per bills paid during his term of office, ending November 2, 1883.

REPORT OF R. J. TRUMBULL, TREASURER.

To the Honorable the California State Board of Silk Culture:

As Treasurer for the period commencing May 10, 1883, and ending November 2, 1883, I beg respectfully to submit the following statement of receipts and disbursements:

Received from Hon. John P. Dunn, State Controller:	
Warrant	\$416 03
No. 167, warrant	320 04
No. 550, warrant	344 69
Nos. 1,165 to 1,183, warrants (inclusive)	773 42
Nos. 1,905 to 1,923, warrants (inclusive)	764 86
	\$2,624 04
Disbursed per vouchers herewith:	
For office furniture	\$387 79
For stationery and printing	102 85
For salary of Secretary	352 63
For rent and fuel	126 40
For trees and cuttings	29 02
For postage, express, and drayage	176 25
For silkworm eggs	130 80
For periodicals and printed books	10 50
For telegrams	1 10
For cocoons	271 25
For Filature furniture	378 55
For steam power	15 00
For labor at Filature	295 40
For exhibitions at Sacramento and Stockton	176 50
For premiums	170 00
	\$2,624 04

Respectfully submitted.

R. J. TRUMBULL.

REPORT OF THE EXECUTIVE COMMITTEE.

The committee has given special attention to the work of the Board at its main office. The varied duties of the Secretary appear to be prosecuted industriously, intelligently, and economically; and the committee has given such aid as it was able to the work of correspondence, and the imparting of information to all applicants. The increasing numbers who write for instruction, or call in person upon the Secretary, show that an interest in silk culture is taking a strong hold upon the people.

Several public meetings have been held in different parts of the State, at which lectures, addresses, and illustrations of the practical work of the industry, have been presented to large and earnest assemblages of the people. The President of the Board has ever been ready to attend such meetings, and by his clear presentation of the subject, has enlisted many new workers. Arrangements are now in progress for a presentation of the industry before the normal classes of our public schools in San Francisco and Oakland, at the earnest request of the teachers in charge. During the coming year, the committee hopes that the advantages of such public meetings may be extended to other portions of the State than those yet reached, particularly in the southern districts, from which earnest appeals have reached us.

Very respectfully,

MRS. H. B. WILLIAMS,
MRS. E. B. BARKER,
MRS. T. H. HITTELL,
Committee.

SAN FRANCISCO, December 24, 1883.

REPORT OF COMMITTEE ON COCOONS, EGGS, AND TREES.

The season for forwarding and receiving cocoons commenced in July, 1883, and continued until November.

Received at the Filature during that time, five hundred and nine pounds of cocoons. The production of this year in the State amounts to nearly fifteen hundred pounds, so far as reported.

A good proportion of the quantity raised was first grade, indeed some were of superior quality, producing eleven ounces of silk from two pounds of cocoons, a result that is seldom obtained. The following counties were engaged in this industry: Santa Cruz, Santa Clara, Butte, San Luis Obispo, Marin, Los Angeles, Sierra, Amador, Alameda, San Joaquin, Contra Costa, San Mateo, Sonoma, Placer, San Diego, and Sacramento; cocoons raised in Marin County took the highest premium awarded at the sericulture exhibit in Philadelphia in 1882, although there were competitors from eleven States in the Union. Sonoma County, also Santa Clara County, have produced cocoons of superior quality, proving that the climatic conditions of those localities are particularly adapted to the raising of silkworms. In 1883 the committee distributed two thousand three hundred cuttings, two hundred trees, mostly of the *morus alba* variety. With few exceptions these distributions were gratuitous. They extended to the following counties: Santa Barbara, Santa Clara, Solano, Alameda, Calaveras, Stanislaus, San Joaquin, Yolo, Sonoma, San Francisco, Amador, Napa, Marin, Butte, Lake, Inyo, San Bernardino, Fresno, San Luis Obispo, Santa Cruz, Tulare, and San Diego.

We are now prepared to furnish, gratuitously, twenty thousand white mulberry cuttings; have already commenced the distribution. Applications for trees and cuttings are pouring in from every county in the State; have furnished one hundred and ten applicants, each with seventy-five cuttings of the white mulberry. We shall distribute young trees later.

Reports from different counties, obtained by your committee, prove that the soil and climate of California are conducive to the growth of the mulberry tree. Wherever there has been particular attention paid to its cultivation, there success followed. It is cultivated to some extent in the following counties: Santa Cruz, Santa Barbara, Sonoma, Amador, Napa, Lake, Kern, San Luis Obispo, Santa Clara, Marin, Nevada, Los Angeles, Alameda, San Joaquin, Calaveras, Contra Costa, San Mateo, Butte, and in several counties not named herein, in limited numbers, for fruit, shade, and ornamental trees.

The State Board of Silk Culture propose introducing from Italy, some of the finest varieties of white mulberry trees; also, buds for grafting. They have recently imported from Italy and Japan grain of superior quality, having employed an expert in making the selec-

tion in Italy. These eggs are said to be the finest variety produced in the world. We are also prepared to furnish, in limited quantities, silkworm eggs; distribution will commence in March. Amount paid out through the committee to producers of cocoons, \$338; amount purchased by the Treasurer, \$128 84; total, \$466 84.

This has been an experimental year; many of those engaged in this industry express their entire satisfaction with the result, signifying their intention of continuing silk culture on a more extended scale another year.

Respectfully submitted.

MRS. E. B. BARKER,
Chairman of Cocoon Committee.

MULBERRY TREES IN THE STATE.

REPORT OF MRS. E. B. BARKER, CHAIRMAN OF COMMITTEE ON TREES AND DISTRIBUTION.

To the Honorable the State Board of Silk Culture:

The committee has made an effort to obtain information respecting the number of trees, their location and condition, in California. As the first essential to successful silk culture is the possession of good trees, planted near the dwellings of the people, we are gathering all the statistics on the subject that can be obtained by correspondence. From numerous letters received, we find that the white mulberry grows vigorously in any part of the State. There are several fine groves of the mulberry in California. From our correspondents, we are able to present the following statistics, which show a good beginning:

Alameda County.—Dr. Gibbons has a few trees. There are a few, also, in Oakland and Berkeley; but the number in the county is limited.

Amador County has from three hundred to five hundred good trees, ranging from one year to twenty-five years old.

Calaveras County.—At Milton there are one hundred and twenty trees, twenty years old.

Contra Costa County.—Mr. Sellers, near Antioch, has three thousand trees, of several years growth. They are in splendid condition.

Lake County.—A few trees are cultivated for their fruit.

Los Angeles County has a large number of good trees of different varieties.

Marin County.—At San Rafael, W. T. Coleman has a number of very fine trees. R. J. Trumbull has in his nursery, at San Rafael, about ten thousand trees of the *morus alba* variety, two years old, and from three hundred to four hundred cuttings planted nearly a year ago.

Napa County.—Mr. Llewellyn, near St. Helena, has a large number of fine trees, about fifteen years old. About seven hundred good trees are in Napa Valley.

Nevada County.—From three hundred to four hundred trees, of different varieties, are flourishing near Nevada City and Grass Valley. Prof. Felix Gillet, of Nevada City, has in his gardens some of the very best varieties, which he will supply on reasonable terms to applicants.

Sacramento County.—A large number of very fine trees line the sidewalks of Sacramento, and there are many small mulberry orchards in the county.

San Joaquin County.—A number of good trees are growing in the town of Lodi.

San Luis Obispo County has sixty well grown *morus alba* trees. A large number of cuttings have been planted this year.

San Mateo County.—At Menlo Park and Redwood City there are several fine trees. S. G. Stevens has several hundred young trees, nearly a year old, at his nursery in Redwood City. Mrs. H. B. Williams, of Menlo Park, has a few rare and beautiful trees, now well grown. Wm. H. Howard, of Menlo Park, also has a few good trees.

Santa Barbara County.—Mr. A. Packard, a pioneer culturist at Santa Barbara, has a few trees. Several years ago a large number were planted, with a view to silk culture. The project was abandoned, and the trees nearly all cut down for firewood. They were a profitable investment in the matter of fuel, owing to the rapid growth of the trees. The climate of Santa Barbara is particularly favorable for silk culture.

Santa Clara County has several hundred good trees; some just started, and many full grown. Mrs. J. R. Laurie, of Santa Clara, has a large number of choice young trees.

Solano County.—Mr. M. S. Curry, of Dixon, has eight or nine large trees, about ten years old. R. J. Curry has two full grown trees, and about sixty others, one year old.

Sonoma County has many very fine trees. At Penn's Grove, Mrs. W. A. Woodward has one hundred; all but two are *morus alba*. They are fifteen years old, and in fine condition. Cuttings can be had from her at the ruling prices.

Tuolumne County.—S. S. Turner, of Sonora, has forty trees, sixteen years old, and in fine condition.

Ventura County.—The climate is favorable, but as yet the number of trees is small.

Yolo County.—At Woodland there are about three hundred trees. Soil and climate are very favorable to silk culture.

MRS. E. B. BARKER, Chairman.

REPORT OF THE FILATURE COMMITTEE.

The Committee on Filature submits, with great satisfaction, this, its first annual report. It has much reason for thankfulness and rejoicing in view of the good work it has already been able to accomplish, and the brilliant prospect it has of finally and fully accomplishing all the objects that it ever contemplated.

PROFESSOR RILEY'S TESTIMONY.

In 1879 Professor Charles V. Riley, Entomologist in the Smithsonian Institution at Washington, stated in his agricultural report of that year as follows:

"There has been no home market for cocoons in America. * * * As a means of meeting the difficulty, I have urged and would urge that Congress give to this department the means to purchase, erect, and furnish with skilled hands, on the department grounds, a small Filature or reeling establishment. In such an establishment reelers could be trained; and the cocoons, at first raised from eggs distributed by the department, could be skillfully reeled and the silk be disposed of to our manufacturers. A market would thus be formed for the cocoons raised in different parts of the country, *and a guarantee be given to those who choose to embark in silk culture.* * * * All industries should be encouraged in their infancy; and for the first years, or until the silk industry could be considered well established, the cocoons should be paid for at the European market rate, plus the cost of reeling."

CALIFORNIA'S LEGISLATURE HAS ACTED WISELY.

We Californians have reason to feel proud that what others have thus hoped for, our State has been the first to achieve. Through a wise munificence on the part of our Legislature, we have been able to establish a Filature to reel and spin the thread from the cocoons raised by the industrious daughters of California; and we are convinced that the Filature, which winds the thread from the cocoon, will furnish employment to many persons, and that in the near future millions upon millions of golden threads will be reeled and woven by the women of California.

FILATURE INSTRUCTION AND WORK.

We have now daily in operation three reels, two driven by steam power and one a hand reel, and eleven young ladies are being instructed in the art of reeling silk. We hope through the superior knowledge of the Superintendent of the Filature, Mr. Paul Consonno, and the expert reeler Mrs. Josephine Soldavini, that the most difficult parts of the business will soon be overcome, and that we will be able to reel silk in California in a manner which will compare well with the silk reeled in France or Italy, where by skilled labor and the aid of the most superior machinery, the reeling of silk has been brought to the highest perfection.

NECESSITY OF SKILLFUL REELING.

In an article by Professor Riley, published in the Rural Press of February 11, 1880, among other things he says:

"If the mere rearing of the worm and the production of the cocoon is simple, the reeling of silk is by no means so, as the greatest skill is required to accomplish the work properly, and the value of a hank of silk depends as much on the skill of the reeler as upon the quality of the original thread."

In a paper read by Mrs. Hittell before the Board, on August third of this year, she explained the necessity of training expert reelers so that we might be able to produce not only superior cocoons, but also that our silk be reeled to the best advantage. In this same connection she now suggests that if we want speedy success in silk culture we must employ only experts who are able to give first class information in the mode of silk culture and silk reeling.

CALIFORNIA'S ADVANTAGES FOR SILK CULTURE.

Our climate is admitted to be the best in the world for raising silk. We have an area of suitable land not to be surpassed in any country on the globe. Worms fed upon the leaves of the *morus alba*, raised on any of our elevated lands or foothills, will produce the finest, strongest, and the most valuable silk in the world. California has an area of about one hundred million acres of land. Two provinces of Northern Italy—that is to say, Piedmont and Lombardy, to which Italian silk culture may be said to be chiefly confined—have an area of only about twenty-five million acres. Those two provinces, besides supplying the home market, furnish for annual exportation raw silk and cocoons to the value of about \$30,000,000. From these facts, instituting a comparison, it is easy to see at a glance the immense future of silk culture industry in our State, if properly assisted and fostered in its infancy. California can easily produce not only better silk but more of it than any other country; and there is no good reason to doubt that the time is not far distant when in value and importance, silk and silken fabrics will rank in California among its first productions.

SILK CULTURE IN PUBLIC INSTITUTIONS.

We would respectfully submit to the attention of the Board the practicability of utilizing the labor of the inmates of our benevolent and reformatory institutions by the introduction into them of silk culture, where the climate and circumstances are favorable. With this object in view we should aim to instruct the young ladies who attend our Filature in such a manner and for such a length of time as to fit them to become normal teachers in all branches of silk culture and silk reeling. In France and Hungary many of the benevolent and reformatory institutions have by the introduction of silk culture into them been made to a great extent self-supporting. For like institutions in our own country silk culture can in the same manner be made a lucrative endowment, lessen expenses, and at the same time utilize a large proportion of our population who now produce nothing.

GOVERNMENT AID IN HUNGARY.

A recent report by M. de Bezerey, Government Commissioner for cultivation of silk in Hungary, shows that this industry is making considerable progress in that country. In 1881 there were two thousand nine hundred and seventy-six producers, who obtained forty-one thousand five hundred and thirty-seven kilogrammes of cocoons in four hundred and twenty-six communes, and the produce was sold for 41,816 florins. The corresponding figures of 1880 are one thousand and fifty-nine producers, ten thousand one hundred and thirty-two

kilogrammes, one hundred and nine communes, and 11,062 florins. The Commissioner sold in Italy the produce of 1881 for 62,000 florins, and the profit realized paid for the institution of a model school for silk cultivation without exceeding the credit voted by the Chamber. This school has received three primary teachers sent by the Minister of Public Education, and three sent by the Minister of Commerce; three more are maintained at private expense. These will acquire knowledge to be afterwards utilized in their place of residence. Further, a professor in the model school of Graz has given public lectures in several villages on the rearing of silkworms, and more than eighty kilogrammes of cocoons for eggs have been distributed gratuitously to cultivators. *Lastly, twenty-eight thousand nine hundred and fifty-six mulberry trees have been planted at government expense.* The report recommends the establishment of spinning mills in the country and the planting of mulberry trees on land belonging to the communes and on government roads. The climate of certain regions of Hungary is highly favorable to the production of silk.

SILK REELING IN OTHER COUNTRIES.

In Italy and France there are two classes of silk produced: country silk, which is reeled in households and by primitive methods, and "Filature silk," which has been reeled with skill in Filatures.

The silk produced in China is in the first instance country silk. To prepare it for exporting it has to be re-reeled, and no little effort was required to impress upon the Chinese the necessity of re-reeling to suit our market.

The reels for this purpose were, in the first instance, made in the United States and sent to China. Their use was brought about by the urgent and repeated representations of American silk merchants there. The re-reeling is, however, not always well done. Aside from carelessness, which alone would deteriorate the value very largely, there is considerable imposition practiced in adulterating Chinese raw silk. Sugar, salt, rice, and acetate of lead are mentioned as among the substances used for adulteration. Importations from China are increasing every year, but the silk has not improved in quality, being adulterated at least as much as hitherto.

The Japanese have taken a different course. Within four or five years they have established a number of Filatures where excellent work is performed. *The Government* has encouraged the work and *owns one of the Filatures* where skilled operatives from Europe were employed at first, and native labor has since been educated.*

RAW SILK IMPORTS FOR OUR MANUFACTORIES.

There are three hundred and five large silk mills in the United States. We import four million two hundred thousand pounds of raw silk, three million pounds of reeled silk, one million pounds of spun silk. We deem it our duty to bring these statistics to the notice of our people for their attentive and earnest consideration.

*Extracted from a report of Wm. C. Wyckoff, Secretary of Silk Association of America.

EXCELLENCE OF CALIFORNIA RAW SILK.

Our State, by granting a small appropriation, has assisted and extended the investigations of the Silk Culture Association; and the Silk Culture Board has tested, and is now able to prove by facts, the great adaptability of California for a silk-producing country. Although we are but novices in silk culture, our reeled silk compares well with the best produced in the world. In some instances small parcels of cocoons sent to us have, when reeled, produced from four pounds of cocoons twenty-two ounces of silk.

NO TARIFF WILL BE NEEDED.

We deem it proper further to state that we are convinced that on account of the superiority of our silk in fineness, gloss, toughness, and elasticity of fiber, it will be preferred in the market, and will be able to command the highest price. If enough is produced it will clear the market of all inferior silk, and we are satisfied that a tariff will never be needed to exclude foreign articles.

CALIFORNIA FAVORABLE TO BEGINNERS.

Experienced silk growers assure us that neither in Europe nor in Asia have the silkworms shown such strength and vitality to withstand carelessness in feeding and handling, occasioned by the ignorance of those who have for the first time raised cocoons, as in California. Notwithstanding bad treatment they have survived and spun good cocoons.

A SELF-SUSTAINING FILATURE.

Our experiments further demonstrate that if sufficient cocoons are produced to keep sixty reelers at work at present rates in a Filature, no more government aid will be required. There will be profit enough to justify private enterprise in taking hold of the business of buying cocoons and reeling and selling the silk.

CALIFORNIA WATER A GREAT HELP TO REELERS.

We further take pleasure in stating that the water of California is better adapted for the purpose of silk reeling than that of almost any other country where reeling is done, on account of its peculiar softness and the absence of alkaline substances. This is of importance, for the reason that while in Italy and France silk reelers suffer much from sore fingers produced by alkaline contained in the water, and substances have to be added to soften it, nothing of the kind is required in California.

MORE INDUSTRIES NEEDED.

Daily the want of industrial employment for our people is more and more felt. In Summer harvesting, in Autumn fruit picking and canning furnish employment to a vast multitude of people, but in Winter thousands flock to the cities begging for work, and their

cry, "give us work, honorable work," is not heeded. Humanity, political economy, and the welfare and safety of our country, demand that we should timely provide suitable labor for those who are able and willing to work.

Thousands of sewing girls in New York, and throughout the Eastern and Western States, are forced to make shirts at fifty cents to one dollar and twenty-five cents per dozen. It has been testified to in Court that a woman of Jersey City made coarse "hickory" shirts at twenty-two cents per dozen, delivering them in New York, and paying for ferriage each way. This reduces her actual pay to one and a half cents for each shirt.

The foregoing statements, amongst many other facts noticed by keen observers, show that we are speedily drifting to the same gulf out of which Europe is now in vain trying to extricate itself by finding a remedy for the neglect of former years. To do our work speedily and well, to make silk culture a success, we would bring to the attention of the Board the urgency of extending our work.

AN EXPERIMENTAL SILK STATION NEEDED.

We need an experimental silk culture station. We need a silk culture school garden, connected with the Filature, to teach and train silk culturists. If we will speedily succeed the Government must invest a few thousands of dollars, and these thousands will in time earn millions, keep thousands from idling, and give to thousands of starving, struggling, and despairing women and children the opportunity of earning an honorable livelihood.

THE MANIFOLD INDUSTRIES FOSTERED BY SILK CULTURE.

The production of cocoons will give employment in the way of reeling, doubling, twisting, cleansing, dying, making sewing silk, cord, braid, chenille, fringes, knitting hosiery, silk felts, weaving silks and ribbons, brocades, velvets, and gauzes. No other industry can be made so generally and universally a never-ceasing source of supplying profitable employment, never ending in worth and never diminishing in demand.

SILK CULTURE BETTER THAN ALMSHOUSES.

It should be well understood that every dollar the State expends to train its children in technical agricultural and sericultural schools will be worth more to society and the commonwealth than thousands and tens of thousands given to almshouses, prisons, and penitentiaries.

St. Louis, Chicago, Philadelphia, Detroit, Cleveland, and Buffalo have already taken hold, as an eastern newspaper informs us, of the great modern lever that is to move the world; that is to say—the principle of making *every one produce something of value*.

We wish we could awaken the attention of our many wealthy citizens to this proposition and interest their philanthropy in this practical direction. There can be no doubt that the future security and welfare of the State depend upon the preparation of the children of the State for useful and industrious pursuits.

WORK OF THE FILATURE.

We take pleasure in acknowledging our indebtedness to Messrs. Carlson & Currier, of this city, who have manufactured from two pounds and eight ounces of raw silk, four hundred and eighty spools of No. A sewing silk, each spool containing fifty yards. This they generously did for us free of cost. The above mentioned four hundred and eighty spools of sewing silk bear the trade mark of the California State coat of arms. We present from Messrs. Carlson & Currier the following

CERTIFICATE.

SAN FRANCISCO, January 18, 1884.

Report of the California reeled raw silk worked at Carlson & Currier's silk mill, in San Francisco, in September, 1883:

Weight of raw silk received.....	2 pounds 8 ounces
Weight when manufactured.....	2 pounds 5 ounces
Weight when boiled off and dyed	1 pound 12 ounces
Total shrinkage.....	12 ounces
Loss	30 per cent.

F. W. BROWN, Superintendent.
CARLSON & CURRIER, Proprietors.

OUR EXPERT REELER.

Our expert reeler is able to reel at least a pound of silk per day; but as her assistance is needed in training pupils, we have as yet been able to reel but a comparatively small quantity of silk.

Our experiments have demonstrated that it requires a little less than four pounds of our cocoons to reel one pound of raw silk. Mrs. Soldavini had reeled, up to November first, twelve pounds and five ounces of first class silk; from the premium cocoons she reeled one pound and seven ounces.

OUR SCHOLARS.

The scholars have reeled one pound four and a half ounces, making in all, fifteen pounds and half an ounce of raw silk, so far reeled at our Filature.

The names of the scholars now daily in attendance at the Filature room and the date of their entrance are as follows:

September 1—Miss Henriette Burnhof.....	140 Green Street
October 1—Miss Jean Dodd.....	202 Stockton Street
October 9—Miss Adeline Celio.....	11 Hopton Terrace
October 23—Miss Henriette Hermann.....	821 Greenwich Street
October 23—Miss Lucie Hermann.....	821 Greenwich Street
October 22—Miss Natalina Isola.....	Mission Garden Ranch
November 6—Miss Frances Mentel.....	632 Broadway
November 6—Miss Carrie Reel.....	114 Valparaiso Street
December 1—Miss Mary Cortsen.....	4 Jackson Place, off Montgomery
December 17—Miss Gertie Jones.....	1834 Union Street
December 28—N. Peck.....	San Francisco

SILK REELED.

Silk now reeled and on hand at the office, California Street.....	18 pounds	8 ounces
Silk at the Filature.....	4 pounds	5 ounces
August 30—Silk delivered to Messrs. Carlson & Currier.....	2 pounds	8 ounces
September 29—For Mrs. Stoddard, of San Joaquin.....	2 pounds	13 $\frac{3}{4}$ ounces
November 19—For Mr. Edw. Wickson.....	0 pounds	2 $\frac{3}{4}$ ounces
December 7—For Mrs. F. Fenton, of Santa Clara.....	0 pounds	3 $\frac{1}{8}$ ounces
December 13—Pacific R. R.....	0 pounds	5 $\frac{3}{4}$ ounces
October 16, 17, 18, 19, and 20—Silk reeled for prize.....	1 pound	6 $\frac{1}{8}$ ounces
Total.....	30 pounds	3 $\frac{3}{4}$ ounces

Respectfully submitted.

MRS. THEODORE H. HITTELL,
Chairman Filature Committee.

ANNUAL REPORT OF THE HEALTH COMMITTEE.

Dr. C. A. Buckbee, President State Board of Silk Culture:

During the year just closed the Health Committee on Silkworms met monthly on the day of the regular Board meetings, and considered the various communications referred to it and coming within the scope of its duties.

The renewed efforts at silk culture in the State, caused by the establishment of the Board of Silk Culture, brought many letters of inquiry; and those referring to failures or partial failures in rearing silkworms were referred to the Health Committee for explanation and for instruction for future guidance.

Among those so referred was a case where most of a large brood of worms had done well up to their last stage and then sickened and died rapidly. An investigation with the aid of a microscope of high power revealed the presence of the corpuscles of that dreaded disease known as

PEBRINE.

Pasteur and other investigators of silkworm diseases discovered that pebrine is always accompanied by the abundant presence of these minute bodies, and that it may be either hereditary, or generated, or communicated by contagion. Hence the corpuscles can be contained within the egg of the silkworm; the larvæ are then predisposed to the disease, which will afterwards be developed by any weakly or morbid condition of the insect. There then ensues a rapid multiplication of the corpuscles, which finally fill and engorge all portions of the body, causing the ultimate death of all sickly individuals or broods at some one of the stages of development. Diseased worms may even spin cocoons apparently healthy, but producing a similarly diseased progeny, if any.

Pebrine has been claimed by some to be a fungus disease, and the systematic name of *Micrococcus Bombycis* has been given to the corpuscles, but it is doubtful that this view can be maintained, as they

seem incapable of any farther development than simple multiplication. According to the latest investigations they are related to the *Bacteria*.

Pebrine is induced and favored by any cause that lowers the health-tone of the worms, but especially by want of cleanliness affording an opportunity for the introduction of their own effete matter into their food in the shape of dust, etc. This, in fact, seems to have been the original cause of the disease, which was then rapidly increased by contagion and inheritance. It is therefore of the utmost importance that the rearing cages or boxes be kept scrupulously clean; and that they be washed or otherwise disinfected from year to year; and the feeding of dusty leaves is always dangerous. Other predisposing causes are an insufficient supply of food; unsuitable food, such as stale leaves, wet leaves; the failure to maintain a regular temperature; excessive crowding of the worms, whereby they become liable to eat more or less of each other's offal, etc. In California, fortunately, the maintenance of an even temperature during April and May is easy with ordinary care, since it is only extraordinary meteorological changes that the brood is to be guarded against, and thunder storms are almost unknown.

While these precautions will prevent the origination of the disease, it is none the less important to prevent the introduction of the hereditary tendency; with this view the Health Committee submitted at the annual meeting of the Board the following proposition, which was adopted, viz.: "That the various consignments of silkworm eggs intended for distribution during the season of 1884 be examined by the ablest microscopists with a view to the detection of any sporadic germs of disease these eggs might contain, and that no eggs be distributed without first having the recommendation of the Health Committee."

The parcels of eggs from Japan and from Italy are now being investigated in accordance with the spirit and meaning of the above mentioned order; and the Health Committee hopes that by strictly carrying it out, one great source of disease threatening the silk industry of the State will be nearly or quite done away with.

E. W. HILGARD, University of California,
MRS. T. H. HITTELL, 808 Turk Street, San Francisco,
J. J. RIVERS, Curator Museum, University of California,
PAUL CONSONNO, Superintendent of Filature,
DR. WM. P. GIBBONS, Alameda,

Committee.

REPORT OF MRS. JEANNE C. CARR.

Hon. C. A. Buckbee, President State Board of Silk Culture:

As one of the Commissioners, I submit my report for 1883. The progress of silk culture in this section of the State is small in proportion to that of other industries, and while there is no reason for discouragement, the experiments made have been on too small a scale

to satisfy the public that the profits would be reasonably certain. There has been no opportunity here to interest the public through such exhibitions of worms at work, as have been made in San Francisco; our district and county fairs having occurred too early or too late in the season. I have exhibited cocoons only.

In the four southern counties, small crops have been raised by parties who have obtained slips and eggs from Pasadena; we hear only good reports as to the health of the worms and quality and size of the cocoons.

A large number of letters of inquiry have been received from nearly every State in the Union, and also from Europe, as to the adaptation of this State and section to silk culture, and I have replied by sending such printed documents as have been issued by our societies, and also small mail packages containing the pressed leaves of our various mulberries, with specimens of cocoons, eggs, etc. Similar packages have been sent to the leading agricultural schools of Europe, also to the headquarters of the immigration societies; and during the Conclave a considerable amount of the previous year's crop was distributed to be preserved as mementos of the visit of the Knights Templar to our coast.

The invariable question, "does the silk culture pay," one can only answer by offering the statistics furnished by our own and kindred associations. We can demonstrate that it pays the people of France, Italy, China, and Japan; that it has been an immense benefit to those countries; that the production of the necessary amount of silk to feed the silk mills now in operation in the United States would be an immense saving to the nation, and that we have a large area well suited to the production of silk, etc.

And we can show that here is an industry admirably fitted to the needs of a class daily increasing in numbers, of unemployed women and children.

We can show that silk culture may be made to pay *well*; whether it *will* pay depends upon individual conditions and characteristics, in this no more than in other callings.

I have most diligently sought to interest our public school teachers in the work of the Board, to the end that their pupils would be prepared, through the bias imparted by the teacher, to become skillful and intelligent silk culturists. The people who call upon us in Winter "to see the silkworms," are often "well educated," yet lack this bias, and have not been trained to observe.

I regard the work of the State Board as largely educational, and consider it of the utmost importance that its means for the diffusion of information should be increased.

The members of the Board in Southern California have been cheered and encouraged by the results of the more abundant labors of their northern colleagues, and are heartily in accord with them in promoting the beneficent objects for which it was created by the State.

Regretting my inability to attend the meetings of the past year, I remain,

Most respectfully yours,

JEANNE C. CARR,
Silk Culture Commissioner.

PASADENA, LOS ANGELES COUNTY, December 24, 1883.

REPORT OF MRS. FLORA M. KIMBALL.

FROM SAN DIEGO COUNTY.

This county, being but lately settled, large in extent—containing nearly fourteen thousand square miles—with a population of less than fourteen thousand, and the people being so absorbed in home-making and the establishment of permanent industries, that the silk industry has as yet made but little progress. Preliminary work, however, has been done, and interest awakened in the best minds of our energetic men and women. Mulberry cuttings are being planted, and silk literature is being circulated and carefully read throughout the county.

Nature has richly endowed this locality with the requisite conditions for successful silk growing; in a climate unsurpassed in equability of temperature, the extremes during the year being but forty degrees, a dry atmosphere, free from electrical disturbances, and a rich soil in which it is believed the mulberry will thrive.

The agricultural portion of the county is being gradually settled by an industrious thrifty class of eastern people, who, I believe, will gladly add sericulture to other home industries when the matter is fairly brought to their attention. Being so far removed from the silk growing districts of the State, and having among us so few who have experimental knowledge of the work, the progress will not be rapid, but it will go on, and, it may be, take deeper root for the disadvantages that we shall labor to overcome.

Regretting that I have so little to record of advancement in silk culture, I am still hopeful for the future of this industry in the extreme southern portion of the State, and shall labor faithfully with my limited resources to aid in establishing it as fast as conditions will warrant.

FLORA M. KIMBALL,
Silk Culture Commissioner.

SPECIAL COMMITTEE'S REPORT ON PRIZE COCOONS.

To the Honorable the State Board of Silk Culture:

Your committee on award of premiums for 1883, having finished the work assigned them, now respectfully report:

There were twenty-seven competitors for the ten prizes to be awarded, inclusive of five children between the ages of ten and fourteen years. These competitors represented fifteen counties, namely:

Santa Clara, Sonoma, Contra Costa, Marin, Nevada, San Joaquin, Sacramento, Calaveras, San Diego, Amador, Alameda, Los Angeles, San Luis Obispo, Napa, and Placer.

The cocoons were received by your committee from your Secretary, under the instruction that no sample of less than one fourth of a pound in weight was to be considered. By order of your Board they were sent for exhibition to the State Fair at Sacramento, and from thence to the San Joaquin Valley Fair at Stockton. They were sent in glass jars, sealed, and each jar bearing the name of the producer. They were returned to your committee in the same condition, except that two of the jars had been broken; but the contents of the broken jars had been under the constant guard of the Superintendent of the Filature, and remained intact. They were then taken from the jars by your committee, weighed with the utmost care, the names of the producers removed, and numbers indiscriminately substituted in place of the names, in order to avoid the possibility of any partiality or favoritism in the process of reeling.

The reeling was done under the management of the Superintendent of the Filature, and under the daily and constant supervision of your committee. A daily report was made by the Superintendent, and when the work was completed, under the regulations prescribed for our guidance, we were obliged to award the prizes as follows:

FIRST PRIZE.

The first prize due to the producer of one fourth pound of cocoons yielding the greatest weight of silk, the yield being one and three eighths ounces of silk, fell to No. 11, representing Mrs. Louise Rienzi and R. W. Mantz, San José.

SECOND PRIZE.

For the second prize we found that two samples had yielded precisely the same weight, being each one and one eighth ounces. We seemed to have no alternative in this case except to be governed by the quality of the production. Resorting to this additional test, the prize fell to Mrs. C. E. Babb, of San José.

THIRD PRIZE.

For the third prize we found five samples yielding precisely the same weight—one and one sixteenth ounces. We again resorted to the test of quality, and by that test the award fell to No. 1, who proved to be Mrs. Elizabeth Stevens, San José.

FOURTH PRIZE.

We encountered the same difficulty in awarding the fourth prize, five samples having yielded the same weight, each one ounce. The same rule was again applied, and the prize was allotted to No. 8, afterwards ascertained to be Mrs. Wm. Gwynn of Sacramento, who produced a very fine quality of Japanese silk. Only one other sample of that variety was exhibited for competition, which was also very fine, but less in weight.

FIFTH PRIZE.

The remaining prize (for adults) fell to No. 24, and the successful aspirant was Miss Sarah Heald of Petaluma. This yield was remarkable, one and three sixteenths ounces, but of inferior quality. This sample was not entered with the others, and considering the quality we could not conscientiously do more than award it the fifth prize, to which it is justly entitled.

CHILDREN'S PRIZES.

As there were but five contestants to share the five prizes to be awarded to children we had but little embarrassment in reaching our conclusions. The exhibit of the little ones was very creditable and most satisfactory. The cocoons were very neatly packed in boxes, arranged with great care, and, although but two sent the requisite quarter of a pound, yet the quality of their cocoons compared most favorably with those of adults.

FIRST PRIZE.

The prize for children, yielding a little more than seven eighths of an ounce of silk of fine quality, was given to No. 14, and proved to be a little miss of ten years of age—Miss Lillie Cook of San José.

SECOND PRIZE.

The second prize, yielding seven eighths of an ounce, also of excellent quality, was won by Miss Stella Machfert of San José; age, thirteen years.

THIRD PRIZE.

The third (special) prize, a sample box of splendid quality, is awarded to Adolph Muller of Nevada City; age, thirteen years.

FOURTH PRIZE.

Fourth prize (sample box), also good quality, is awarded to Harry K. Potter, Nevada City; age, fourteen years.

FIFTH PRIZE.

Fifth prize (sample box), mostly double cocoons, is awarded to Miss Sophie L. Smith, Petaluma; age, twelve years.

CONCLUSION.

In conclusion let us add that perfect harmony of feeling and unanimity of judgment has prevailed from the beginning in your committee, and so, notwithstanding the tax upon our time and strength, our task has not been altogether an unpleasant one. If our labor shall result to the satisfaction of those interested, and contribute in any degree to the advancement of the silk industry in California, the prospect of which is now cheerful and hopeful, we shall feel amply rewarded for our labors.

We congratulate you upon the pleasant outlook, and rejoice at the opening up of this new, pleasing, and profitable employment. To the President of your Board, to the Superintendent of the Filature, to your Secretary, and to all with whom our duties have brought us in contact, we return thanks for their unvarying kindness, courtesy, and aid.

Respectfully submitted.

MRS. L. E. PRATT,
MRS. J. McEWEN,
MRS. W. J. STRINGER,
MRS. G. W. FRINK,
Committee.

REPORT FROM MRS. WM. B. BOURN, ST. HELENA.

HER FIRST EXPERIMENT IN SILK CULTURE.

To the State Board of Silk Culture of California :

Mrs. William B. Bourn, of Madrono (St. Helena) awaits the orders of the State Board of Silk Culture to place at the disposition of said Board a gift of two thousand one hundred and fifty cocoons, the result of her first experiment in sericulture, the history of which is as follows:

March twenty-ninth, Mrs. Bourn placed in a box cover a very small quantity of grain, which she had obtained from Mr. Gillet, of Nevada City. This was kept in her sewing room where the temperature averaged sixty degrees Fahrenheit—the thermometer falling a trifle at night. On April second a few worms appeared, whereupon instructions given in the “California Silk Grower’s Manual” were implicitly followed, which instructions were corroborated by those contained in reports bearing upon the subject, which Mrs. Bourn had received from Washington. Not being provided with a properly furnished cocoonery, tables and impromptu trays were brought into requisition, the latter consisting of laths interlaced with cord. The worms were fed four times a day, viz.: at seven and eleven o’clock A. M., and five and eleven o’clock P. M., the leaves being furnished to Mrs. Bourn by Mrs. Lewelling, her adjoining neighbor, who happily is possessed of a few mulberry trees in full bearing.

The first hatch occurred April second; then upon each successive day, until April sixth, when all the grain was finished. Strange to relate, every egg was hatched, the last of the worms being more vigorous than the first. At this stage, the temperature was raised by means of a fire to seventy degrees; from time to time accommodations were increased.

The first spinning commenced May sixth, white oak boughs being used for the purpose. This was completed by the thirteenth, whereupon shifting began, which in turn was finished by the twenty-second. This last process was effected by placing the cocoons in boxes cov-

ered with panes of glass, and placing them upon a tin roof in the sun. The weather, during this period, was intensely warm.

There were among the lot one hundred and fifty laggards, which were two weeks behind. These were fed separately, and eventually produced very good cocoons. Of the two thousand one hundred and fifty worms but seven were lost, two of which fell from the table, the other five were poisoned by a powder which had been placed in their vicinity for the purpose of destroying ants which had inopportunely appeared upon the scene of action. In connection with this same powder a curious incident occurred: A servant, unadvisedly sweeping the room, scattered the poisonous dust through the air, whereupon the worms writhed in seeming agony, the convulsions lasting upwards of an hour. However, no ultimate injury was done.

Another fact may be worthy of note: A severe thunder storm occurred while the spinning was in process, but without visible effect upon the worms.

In conclusion, Mrs. Bourn announces her intention of encouraging this beautiful industry in Napa Valley, where both soil and climate are peculiarly adapted, not only to the propagation of the worm, but to the growth of the mulberry tree, of which she herself has had five hundred planted this year, to which number she proposes to add next year three thousand more, having already given orders to that effect.

Through Mrs. Pellet, who has watched her experiment with much interest, Mrs. Bourn sent specimens of cocoons to the St. Helena Grange, where much interest was manifested in the subject, concerning which an address was made by Mrs. Pellet. The many persons in St. Helena who are interested in sericulture hope soon to have a verbal address from one of the members of the State Board of Silk Culture.

On the principle of applying to a busy man to attend to one's business, Napa Valley is admirably adapted to the fostering of this industry, for it is a hive in which there are few or no drones. Sericulture could be successfully prosecuted in the intervals of viticulture—the season for the former occurring during those months when the work in the vineyard is finished and that in the wine cellar not yet begun. Therefore there would be no clashing of interests, although the division of labor between the sexes would obviate that difficulty. On the contrary, the very fact of sericulture being an incidental, rather than a main resource, would be to its advantage, inasmuch as the industry might thus be undertaken individually upon a smaller, therefore more successful, scale. But, unfortunately, every one in Napa Valley is not possessed of a vineyard; then to these half a loaf is infinitely better than no loaf at all. So blessed be the day which opens a new enterprise to the men, women, and children, not only of the Atlantic but of the Pacific States, who in the bustle of life have been jostled out of the crowded thoroughfare.

MISS S. R. HEATH.

FRENCH AND JAPAN COCOONS COMPARED.

SPECIAL PAPER BY MRS. T. H. HITTALL, READ BEFORE THE STATE BOARD OF SILK CULTURE,
AUGUST 3, 1883.

One of the first objects of the California Silk Culture Association was to gather, from the many experiments made in this State, correct data as to the feasibility of silk culture in California. In the data so collected, there is the most satisfactory proof of the adaptability of our soil and climate for the production of silk in all those portions of the State which are not exposed to the fogs and cold winds of our ocean bound shore.

The second object was the establishment of a Filature. This is now about to be put in operation by virtue of an appropriation from the Legislature. The most difficult part of silk culture, however, lies directly before us. The real value of our silk will depend chiefly now upon the manner in which it is reeled. If it has luster, elasticity, toughness, and strength of fiber, like the French, the Turkish, and the Milanese, it still requires the defty fingers of experts, trained in reeling, to produce silk which will bring the highest price.

It is also of great importance to have a large quantity of cocoons, in order to grade them according to color, form, weight, and race, so as to produce an even thread. But much depends upon adjusting the thread to produce good silk. As the cocoons are formed of three distinct layers of reelable silk, the outward, the middle, and the inward, much skill and judgment are required on the part of the reeler.

The thread of the French annual cocoon, in an unbroken length, measures, on an average, eight hundred and eighty-six feet. The white Japan annual, averages nine hundred and fifty-nine feet; thus the French annual measures seventy-three feet less than the Japan. But French annuals are desirable, because they are hardy and strong, and are therefore able to spin a thread which varies less in size than the cocoons of other races.

The middle layer of the French annual cocoon measures in thickness, on an average, thirty-five thousand parts of a millimeter, in the middle; the outside and inside layers measure twenty-five thousand parts of a millimeter. The thread of the Japanese cocoon varies from twenty-two thousand parts of a millimeter for the outside, to thirty thousand for the middle and seventeen thousand for the inside.

Silk culture, though it originated with a so called barbarous people, is full of interest for intelligent persons. The most civilized nations of the globe have made it one of their chief industries. Our own people must take advantage of the experience gained, and the rules laid down by them, in order to become successful; but in time we may be able to improve upon our teachers, while in starting we must begin with their knowledge. If we equal them we will succeed; if we excel them, we will succeed so much the more.

It is pleasing to think that we may make great improvements in silk culture; that we may yet be able to aid and instruct our teachers. But whether we do so or not, it will be a great reward for us that we have demonstrated that as good silk can be raised in California as in any part of the world, and that its culture in this State is remunerative and profitable; in other words, that silk culture in California can be made a success.

VALUE OF MULBERRY TREES TO THE FARMER.

SPECIAL PAPER BY C. A. BUCKBER, PRESIDENT OF THE STATE BOARD OF SILK CULTURE.

For many purposes the mulberry tree is of great value. The wood of the white mulberry (or *morus alba*) has a fine compact grain, a nice citron-yellow color, and takes a beautiful polish. It is well adapted to the needs of the cabinetmaker, the cooper, and the cartwright. In ship building it has a value which some regard equal to that of the oak. It makes durable fence posts and vine stakes. The bark of the young limbs yields a kind of tow nearly as fine as silk. Tablecloths of this material were thought worthy to be presented to King Henry IV, by his friend Oliver de Serre, the father of French agriculture. From the bark of the mulberry the people of China and Japan produce a strong and beautiful paper.

The berries of this tree are valuable. Fowls fatten upon them. They are sweeter than raspberries, and are prized by many persons as a table delicacy. The tree is ornamental. If left to grow without pruning it will reach a height of forty or fifty feet. Its roots strike deep, so that it will stand a season of drought and flourish when many other trees would be withered. But by pruning it can be grown as a hedge, which gives it special value for California. In dry seasons, in Europe, its leaves and fruit are fed by farmers to their stock. It has often saved animals from death when grass failed in the field. In some places in Europe it is sown and harvested as a substitute for hay. When to all these considerations its value for the production of silk is added, the mulberry tree commends itself to the most favorable consideration. Its uses are many; its value is inestimable. It facilitates the fall of rain; it is a substitute for hay; it is useful for fencing, for fuel, for cabinet wood; and, most important of all, it is a source of great wealth to those nations that cultivate it for the production of silk.

The State Board of Silk Culture earnestly recommend the planting of mulberry trees to the attention of farmers. Fifty or a hundred trees planted around the farmer's house will lay the foundation for a home industry that will enable the women and children of the family, in a short time, to earn several hundred dollars every year.

School teachers and school Boards should cause mulberry trees to be planted near the school house. They will afford a beautiful shade;

but more than this: a few such trees will enable an intelligent teacher to instruct the pupils (without interfering with ordinary school studies) in regard to an industry that will help the boys and girls in part to support themselves as soon as they leave school. We are spending not less than three million dollars a year for public school education—not a dollar too much! But the battle of life requires something more than book knowledge. The training schools of the nation, at West Point and Annapolis, are educating the boys for soldiers and sailors. For this purpose they put them in tents and on ships. They are taught to handle firearms, to make powder, to take long marches, to handle ships. They are drilled in the duties of their future work on land or sea. This fact is suggestive to our educators.

Railway managers should plant the mulberry tree along their roadways, especially where they have large tracts of land to be sold to future settlers. Thousands of silk culturists from Europe are looking to the Pacific Coast with longing desire. The half section of land that has a hundred good mulberry trees upon it would command a higher price on that account, because the women of the family locating upon it would by silk culture, in a few weeks, earn a good portion of the family's needs for several months, while the men were building or getting the land ready for some other industry.

Supervisors should plant mulberry trees along the public highways. In France the Government provides for the planting and care of these trees. They are rented by the season to poor families in the country and in the villages; the income from such rentals is used to keep the roadways in good condition. They are thus a source of revenue, while at the same time they give beauty to the landscape.

THE TIME FOR PLANTING TREES.

From December to March is the proper season for planting, when the rains have made the soil sufficiently moist to nourish the young roots. Many thousand cuttings and young trees have been distributed by the Board, and the demand is great for further supplies. The State Board will assist in this work whenever its aid is needed. It will furnish white mulberry cuttings or young trees to the extent of its ability. Those who wish for information on this subject, or desire the aid of the Board in securing young trees or cuttings, should write to the Chairman of the Committee on Trees, etc., Mrs. E. B. Barker, No. 14 Stanley Place, San Francisco. Correspondents should state carefully their location, or Post Office address, and the number of trees or cuttings desired. Applications are attended to in the order received.

HOW TO GROW THE MULBERRY TREE.

SPECIAL PAPER READ AT THE MEETING OF THE STATE BOARD FOR DECEMBER, 1883, BY MRS. T. H. HITTELL, CHAIRMAN OF THE FILATURE COMMITTEE.

The production of superior silk in abundance depends much on the species of mulberry plants and their cuttings and pruning.

As the quantity and quality of the silk depends upon the quality of the leaves used to feed the worm, the following points are of prime importance:

First—The greatest care should be taken to procure the best silk producing species of mulberry plants. Trees of inferior quality should be improved by grafting them with cuttings of superior quality.

Second—The tree should, from the first year on, be carefully trimmed down, as the production of a rich and healthy foliage depends much on the pruning.

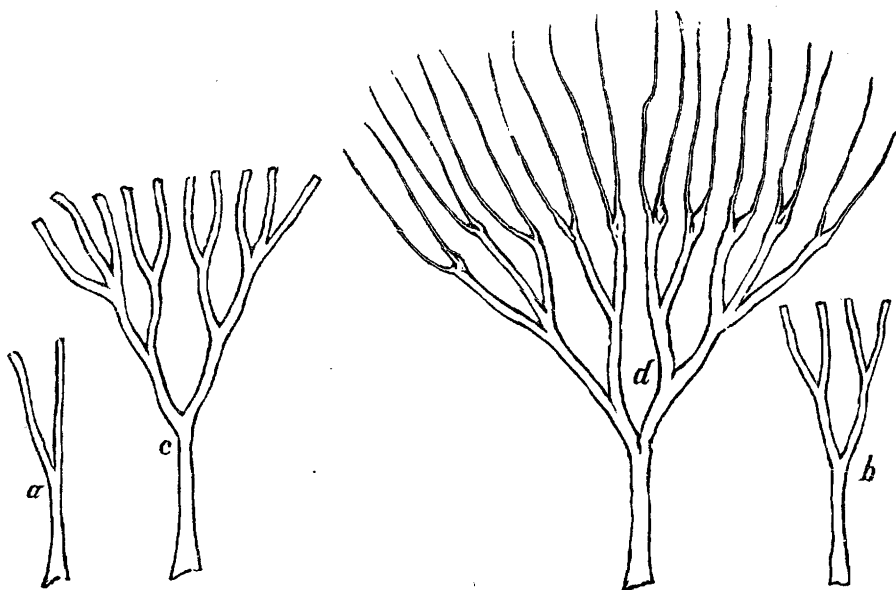
Third—The sunny slopes of our foothills, having a dry, light, and loamy soil, are highly favorable. Trees grown on our foothills or elevated plains will produce more resinous than saccharine matter; and therefore, in choosing ground for mulberry plantations, elevated land should be given the preference. Low and damp ground, on the contrary, is not favorable.

In the composition of the leaves of the mulberry tree there are a number of different substances; among them are prominent solid or fibrous material, coloring matter, saccharine, and resinous or silky matter. The three first substances are not of great importance for the life of the silkworm. The saccharine matter nourishes and aids in the formation of the animal, and the resinous matter imbibed by the worm from the leaves is accumulated and purified by its peculiar organization, and collected in the two reservoirs of the worm, to be given forth afterwards through its mouth in the form of silk.

The yield of silk will be found in accordance with the presence of more or less of the saccharine and resinous matter in the leaves on which the worm is fed. It has been noticed that the silk produced by worms fed on black mulberry leaves, which are hard and tenacious, is abundant and strong but very coarse, and of an inferior quality. But worms fed on the leaves of any variety of the white mulberry, planted on elevated ground, produce the best and finest quality of silk. It is almost unnecessary to state that the less nutriment there is in the leaves the greater will be the quantity of leaves required to develop the worms. Worms fed on leaves which contain much saccharine matter will grow large and spin a large cocoon, but will produce less silk than those fed on leaves which contain a large amount of resinous matter.

There are many varieties of the white mulberry. For grafting, we would recommend as among the best belonging to the improved Alba variety, the "*Giazzola a foglia dappia*," "*Mascula pedemontana*," and

"*Rosea di Lombardia*." They are each rich in saccharine and resinous matter. Experiments made with one hundred ounces of freshly gathered leaves of each of these varieties showed the yield, after being properly dried, to be as follows: *Rosea di Lombardia*, thirty ounces; *Giazzola a foglia dappia*, thirty-one ounces; and *Mascula pedemontana*, thirty-six ounces.



PRUNING THE MULBERRY.

The time of pruning the mulberry tree begins in November. All loose or crooked branches are cleared away, and an endeavor is made to give the tree a neat umbrella-like shape, as most auspicious for the growth of large and thick leaves. During the second, fifth, eighth, and twelfth months they are richly manured. The manure of pigs, sheep, cattle, and horses is used; cotton seeds, oilcake, beancake, and the like are still warmer and richer. The mulberry grounds should be kept clear of grass and well plowed.

At the beginning of January or February the young mulberry tree, a year old, is cut down to a height of one foot six inches from the ground. During the early part of Summer, when the tree is about three to four feet high, the upper part is cut off to about one foot four inches above the original stem, fig. *a*. Again, the next Spring, the tree having now four sprouts, of which two are allowed to grow on the middle branch and three on each side branch, which will attain a height of five or six feet, fig. *b*. These new branches formed during the Summer should again be cut or pruned down in the same manner as before described to a distance of one foot three inches in the coming Spring of the next year, fig. *c*. The tree eventually becomes of the form shown in fig. *d*, and should be kept trimmed down to about ten feet from the ground to the top of the tree.

The intention of the illustrations is to show that if the trees are well trimmed they will form healthy, long, and even shoots, with a

healthy foliage which can be gathered in a quarter of the time that leaves can be gathered from a badly trimmed tree.

This easy method of gathering large quantities of leaves is by passing the half-clothed hand upwards along the shoots, and strip its rich and luxuriant foliage.

HOW TO SELECT COCOONS FOR EGGS.

BY MRS. T. H. HITTELL, OF THE HEALTH COMMITTEE.

The principle "that the most perfect and in all stages most healthy species will bring forth the best grain," should, above all other considerations, rule the silkworm raiser. None but perfect cocoons should be selected to keep for grain (eggs).

Cocoons with a thin covering, double cocoons, and such as are not well formed, spotted cocoons, and those of worms which have been tardy and late in spinning, should not be used for grain.

The cocoons used for grain should be put in only one layer (not heaped one upon the other). They should not be shaken. If the temperature is favorable, the moth will appear in from twelve to eighteen days after the cocoon is spun.

Only those should be selected for grain which feel firm and are of a healthy color, and so far as possible an equal number of males and females.

The male cocoons, some say, may be known by their form, the male cocoons being slender, depressed in the middle and pointed at both ends. The female cocoons are larger in size and of a rounder form, resembling in shape a hen's egg. But we think the cocoon is not always so formed that one can detect the gender. It is of great importance that we should select carefully our best cocoons for grain, and with our fine climate, highly favorable as it is for silk culture, we will be able to improve, from year to year, the size and quality of the cocoons.

HOW TO KILL THE MOTH IN THE COCOONS.

Within a week after the cocoon has been spun, the chrysalis must be killed. This is commonly done by steam heat; but in the climate of California it may be done by exposing the cocoon to a hot sun from nine to four o'clock for two or three days. A longer time will be needed if there is much air stirring. An examination of a few cocoons will determine when the work has been properly done. A moderate oven heat is sometimes resorted to for killing the moth. But the heat of an oven destroys the fine gloss of the silk; and sun heat, also, fades and somewhat injures the gloss of the cocoon.

If one wishes to retain the natural color of the cocoon, and the glossiness of the silk, the chrysalis may be killed by placing the cocoons in any close vessel or box, into which steam may be con-

ducted from a teakettle or boiler. A common wash boiler can be used by putting a little water in the bottom; but the cocoons must be kept a few inches above the water. The cover should be closed and kept tight, but not so close as to admit of any explosion.

HOW TO PREPARE COCOONS FOR THE MARKET.

When the chrysalis has been killed, spread out the cocoons on boards or shelves in a well ventilated room to dry. Turn them over frequently for the first three or four days, and afterwards occasionally for six weeks or two months. When thoroughly dried they are ready for market. In this condition they will be received at the Filature. They should be packed very carefully in clean cracker boxes or barrels. The boxes or barrels should first be weighed and their weights marked, so as to ascertain the weight of the cocoons contained, after they are packed.

Before packing, it would save time in determining their value at the Filature if the cocoons were carefully sorted, those of the same quality being packed together in the same box.

Great care must be taken at all times, in handling, drying, and packing the cocoons, not to jam or crack them. Such an injury would break the thread and destroy the cocoon for reeling.

While packing the cocoons, care should be taken to guard against insects. A little pulverized camphor gum, or other insectifuge, should be sprinkled over each layer of three or four inches in depth. Tobacco stems, if freely used, would probably do just as well; and they will usually cost little or nothing, as they can often be had at cigar factories for the carrying away. Care should also be taken at all times to guard the cocoons against moths, mice, and ants.

REPORTS TO THE SILK CULTURE BOARD.

It is both desired and expected that all silk producers throughout the State will put themselves in communication with the State Board. Careful accounts are solicited in respect to the time of hatching; the number of days between the first, second, and third moults; the time of spinning; and in fact any information of importance to the development of silk culture in California. The report of Mrs. W. B. Bourn, of St. Helena, published elsewhere, while full of information, is a model for such reports as should be sent to the Board by all silk culturists in California.

SILKWORM DISEASES.

BY MRS. T. H. HITTELL, OF THE HEALTH COMMITTEE.

Silkworms, like all other animals, are subject to certain diseases, which different authors have at different times described in different terms. None of the descriptions are entirely satisfactory. But as it

is necessary for us to watch over the health of the worms, we mention some of the symptoms of their diseases. Among the diseases most prominent are: *Maladie des Corpuscules*, *Maladie des Petits*, *Atrophie*, *Consumption*, and *Spotted Disease*.

Silkworm disease we find mentioned in the year 1688, in Italy and France. Since that time it has occurred in Europe at various times. In the year 1853 France raised twenty-six million kilogrammes of cocoons, and in 1856 the production, on account of disease, fell to five million kilogrammes. (A French kilogramme is equivalent to about two and a quarter pounds avoirdupois.)

Pebrine can be noticed by the following symptoms: An uneven development in the worms hatched and fed at the same time. They moult tardily, and awake late out of the moulting sleep. It is but seldom observed in the first moult, but increases with every moulting sleep, therefore the worms will not, as usual, spin their cocoons in from twenty-eight to thirty-five days, but will often need from forty to fifty days. While healthy worms show a ferocious appetite after moulting, sick worms are sluggish and will eat but small quantities of food. They will remain mostly under the leaves and grow very slowly, and towards the last, or spinning point, the mortality amongst them will be great. A constant sign of atrophic worms is the presence of black spots, with which they are more or less covered, and which, commencing with a muddy yellow, by degrees grow darker, become brownish, and finally assume a glossy black color. Where these spots are found organic functions have ceased. It is to be remarked, however, that worms which have been slightly injured have sometimes black spots on them; but these black spots should not be mistaken for the above named disease. If at an early stage of youth the worm is infected it will die; but if affected at a later stage of development, and particularly if in the last moult, and it forms a cocoon, then the chrysalis and the moth will show the disease and produce diseased eggs. For this reason diseased worms should be removed, and destroyed by burning them. The frames should be washed and scalded with boiling water, and then fumigated to prevent further infection.

Leaves, either mulberry or osage orange, which bear spots, should not be used for food. The leaves should not be tightly packed, as they will ferment and become unfit for food. Feeding with unfit food will cause disease. Dusty leaves should be washed and dried before using. If disease shows itself, the symptoms should be noted carefully, and reported to the Board.

HOW TO OBTAIN THE BEST EGGS.

It is of the very first importance to the success of silk culture in California, that there be no disease among the worms. The most careful precaution should be taken against the hatching of eggs in any way affected. For this reason there should be no eggs raised by experimenters at present, except in cases where the worms are known to be of the very best quality and entirely healthy. All the cocoons raised should be prepared and dried for spinning purposes. There need be no hesitation in so doing, for the reason that the State Board of Silk Culture will be careful to introduce from year to year a plentiful supply of eggs of a superior quality. On account of the danger of disease, and the damage it would occasion the industry, it

is earnestly hoped that no eggs be used for the present, except such as are recommended by the Board. To insure their healthy condition, before distribution, they are examined microscopically, either by the scientists, Dr. Behr and Dr. Harkness, or by other competent gentlemen selected for the purpose by the Health Committee; and all possible care will be taken to insure their excellence. They shall be first class in quality as well as health.

HISTORY OF SILK CULTURE IN THE UNITED STATES.

SPECIAL PAPER, READ AT THE MEETING IN AUGUST, 1883, BY C. A. BUCKBER, PRESIDENT OF THE BOARD.

Cortez, the conqueror of Mexico, introduced silk culture into North America in 1522. He appointed silk commissioners, and caused mulberry trees to be planted, and silkworm eggs to be brought from Spain. In a few years there was a fine mulberry grove near the capital, and the experiment of raising silkworm eggs was a success.

Nearly a century later—in 1609—King James I, of England, urged his governors in the American Colonies to use all their official influence for the promotion of silk culture among the colonists, in order to supply English looms with raw silk. In 1622 England became impatient at the neglect of this industry, and commanded the people of Virginia to prosecute it vigorously, promising rewards to the obedient and announcing punishment for the disobedient. The climate and soil of Virginia were found to be favorable to success. The Colonial Legislature, in 1623, offered a premium of fifty pounds of tobacco for every pound of reeled silk raised in Virginia, and imposed a fine of twenty pounds of tobacco on any planter who should neglect to plant mulberry trees. Upon the urgent solicitation of the King, Virginia offered bounties as follows:

In 1656, four hundred pounds of tobacco to any planter who should continue in the business of silk culture.

In 1657, ten thousand pounds of tobacco to any planter who might raise and send to England £200 worth of raw silk; also, five thousand pounds of tobacco to any one producing one thousand pounds of wound silk.

In 1662, fifty pounds of tobacco was offered for each pound of raw silk.

The Colonies of North and South Carolina, in 1693, were engaged in silk culture, and the town of "Silk Hope" was established, where the industry gave much promise of success.

In 1718, the attention of the people of Mississippi was called to the subject, but the results do not seem to have been a matter of record.

In 1726, Pennsylvania sent to England a quantity of beautiful silk. In that State the industry found favor at a very early date.

In 1732, the people of Georgia were required to plant one hundred

white mulberry trees on every ten acres of cleared land. Very encouraging success was made in that State. In 1735, on the occasion of the King's birthday, Queen Caroline is said to have worn a dress made entirely from Georgia grown silk.

From 1732 to the close of the last century, silk culture was prosecuted in Connecticut. President Stiles, of Yale College, with three mulberry trees, made experiments in silk raising for several years. A quarto volume, in manuscript, written by him, entitled "The Growth, Treatment, and Product of the Silk Worm," is still preserved in the college library.

Brief records of the colonial period of our country show that silk culture found favor almost everywhere on the Atlantic seaboard, and along the Gulf of Mexico; in fact, nearly as far-reaching as the populations of that time; but the industry failed to become firmly established.

Many reasons for the non-success of silk culture in our infant history might be given, but I think one reason, were there no others, would seem to be enough. All the mother governments in Europe were hostile to silk *manufacture* in America. England imposed severe penalties on any shipmaster who should be guilty of bringing any skilled mechanic, piece of iron, tool, or other implement used exclusively in silk manufacture. Expert silk weavers, wishing to settle in the colonies and desiring to ply their trade, were not allowed to do so. The object of the Home Government was to obtain all the raw silk possible for their home factories. They sought to build them up at the expense of the colonists. The result of this policy was disastrous to the silk industry of America, for when the war of the Revolution came, there was no market for the raw silk product of the people for many years. Silk culture requires for its success a ready market for cocoons, and easy and ready communication between the culturist and the manufacturer. This the Revolution completely destroyed.

After the Revolution, during a period of fifty years, the industry in the United States was almost entirely neglected until the year 1825, when it began to show signs of life. In that year Honorable Mr. Miner, of Pennsylvania, brought the subject before Congress in a resolution of inquiry, which was referred to the Committee on Agriculture. The report of the committee was so favorable that six thousand copies were ordered printed for free distribution.

During the next fourteen years, up to 1839, the industry grew into favor, until it took on the form of an almost universal speculation. The people were wild; they forsook their legitimate business and launched into silk culture, having no proper knowledge of the work. They were promised immediate and great wealth by enthusiasts and unprincipled speculators. Every one hoped to become a millionaire in a short time. Stock companies, with officers at high salaries, who were ignorant of the details of the work in hand, sprang into existence, and their deluding promises increased the unhealthy excitement. The silk products of the past were overstated, and the yield of silk from trees, eggs, and cocoons, was vastly overestimated. For such a fever there could be only one result—disaster, and this, when it came, in 1839, was sudden and terrible. Multitudes, who had been deceived by speculators, lost their investments, and this frightful reverse was a great injury to what might have proved a blessing under wiser and better counsels.

Speculation and war are great foes to the industries of the nation. The road to ruin through speculation is as sure as through war. In California we are learning this truth to our sorrow. Multitudes of men and women are going down into poverty through their hazards in stock speculation. Men need to lay to their hearts the great truth, that true happiness, home comfort, and wealth come from honest and remunerated labor. This, in the end, will yield the greatest amount of individual comfort and national prosperity.

Since the disaster of 1839, the real friends of the silk industry have worked wisely and well. During all this period many persons in Connecticut, New York, and other States, as far south as Texas, have been raising raw silk for the sake of the thread needed in home work. Some have found a good profit in selling what has long been popularly known in the trade as "hanks" of silk thread. It is now well understood that the raising of raw silk is properly a home work—a sort of adjunct to the ordinary occupations of women in their own homes. The fact that so many women and girls are out of employment in our country has aroused many of the benevolent and patriotic of their sex to foster home silk culture in order to prevent the evils of idleness among the American women. Not less than twenty women's silk culture associations have been organized in the United States during the last four or five years, at the head of which stand the associations at Philadelphia and in California. The patriotic women of these associations desire to help their needy sisters to a knowledge of this appropriate industry, so that they may be able to help themselves, as the women of other silk growing countries are doing. The present movement has had a steady and healthy growth. Successful experiments have been made in many parts of the country. Under the fostering care of benevolent and patriotic women, silk culture appears to be taking permanent root, and there seems to be no good reason for doubting that it will soon become one of the most important industries of the United States. In California, especially, the conditions of soil and climate are such that it ought to become very prosperous. No country in the world is better adapted to this industry than the Golden State.

HISTORY OF SILK CULTURE IN CALIFORNIA.

BY C. A. BUCKBEE.

The silk industry of California is still in its infancy. Enough, however, has been done to show that there are millions of dollars in it for those who will intelligently and patiently prosecute. European silk culturists who have made California their home are enthusiastic in respect to our soil and climate. They find our conditions for silk culture preferable to Italy or France. Our freedom from thunder storms is highly favorable to the growth and health of the silkworm. There are critical periods in the life of this wonderful insect when a

violent thunder storm will destroy millions of them in a moment. Families in Europe, whose chief support is derived from this industry, will sometimes lose an entire brood, worth hundreds of dollars, during the progress of a sudden and violent thunder storm. Our California culturists are happily exempt from danger on account of these electrical disturbances. During the months of May and June, the best period for silk culture in California, the sound of thunder is rarely ever heard in any part of the State.

PAST EXPERIMENTS AND LEGISLATIVE AID.

Nearly thirty years ago the importance of this industry began to press its claims. In 1856 Louis Provost, at San José, commenced the planting of mulberry trees. He was the pioneer in this great work, and before his death he published a manual, in 1867, on silk culture, the effect of which was to induce many persons to engage in the enterprise. Another silk culture pioneer was Adolph Mueller, also of San José. He began the work about the same time with Mr. Provost. He continued it until his death, in 1869, and his success was a great encouragement to others. John E. Goux, Mr. A. Packard, and Dr. Ord entered upon this industry in 1860 at Santa Barbara, and were very successful in producing fine cocoons, but there being no filature and no market for their product the business was given up. Mr. Goux has still some fine trees and is cheerfully supplying cuttings to persons in Southern California, who, under more favorable auspices are entering upon the work. In 1865, eighteen years ago, the Legislature of California recognized the importance of silk culture by offering a bounty of \$250 to any person who should plant five thousand mulberry trees, and another bounty of \$300 to any one who should produce one hundred thousand cocoons. It was a patriotic and well-meant purpose on the part of the Legislature. If it had at the same time provided means for a filature for the purpose of extracting the raw silk from the cocoons, silk culture would long ago have become

AN ESTABLISHED INDUSTRY

In the Golden State. But it was a work so entirely new to rulers and people at that time that this necessity for success was neither understood nor provided for. Still, the generous offer of the Legislature was not in vain. A large number of persons were induced to plant trees and raise cocoons. In Sacramento, Santa Clara, Sonoma, Nevada, Napa, Contra Costa, Marin, Alameda, Los Angeles and other counties, thousands of mulberry trees were planted, and in two years cocoons began to be raised in considerable quantities, increasing during the next three years until the product amounted to several hundred thousand. In 1868, W. M. Haynie and I. N. Hoag, of Sacramento, raised over eight hundred thousand cocoons, and received the State's bounty. In 1870 a company at Davisville is reported to have produced four thousand pounds of cocoons, worth \$5,000. The expense of the experiment is said to be not more than \$1,500. In the same year T. B. Flint, of Sacramento, it is stated, raised nine hundred pounds. The product of Mr. Hoag was six hundred and fifty thousand cocoons. It is estimated that twenty thousand ounces of silkworm eggs were produced that year in California. There being no market for the cocoons, the main object of producers, from 1865

to 1870, was to secure the bounty of the State for trees and cocoons, and to raise silkworm eggs for culturists in Europe. The war between France and Germany unfortunately closed the market for the sale of eggs. The product of 1870,

WORTH NOT LESS THAN \$100,000,

Was thus left on the hands of the producers, and there being no market in the United States for their cocoons, our pioneer silk culturists became discouraged. Tens of thousands of valuable trees were soon after destroyed. The infant industry, after such a hopeful beginning, was left to languish for years. Still there were a few persons intelligent and patriotic enough to continue their experiments. At Nevada City, Mr. Muller, Prof. Felix Gillet, and Mrs. E. P. Keeney quietly prosecuted the work to some profit, and found it a pleasant and paying industry. Mr. Gillet has never lost faith in the possibilities of silk culture, and its great advantages to California. His own success, and his occasional articles, published in our home journals, have been an inspiration to others, and a prophecy of what may be realized in the near future. From his nursery he is supplying fine young trees and cuttings, and is able to furnish choice eggs to parties wishing to engage in silk culture. The family of Mr. J. A. Garbarini, in Amador County, have been making several hundred dollars a year by producing silkworm eggs. The late Mrs. L. A. Sellers, of Contra Costa County, and some others, kept their trees and produced from year to year a few cocoons of a superior quality. Mr. Paul Consonno, an Italian expert, now Superintendent of the State Filature and Reeling School, made experiments in different parts of the State, satisfying himself that the industry could be established almost anywhere in California. Mr. Joseph Neumann, of San Francisco, made several experiments with gratifying results. In 1877 he raised three hundred thousand cocoons in Sonoma County. The work required his time for two months, in which he had the aid of his son all the time, and two men during the last two weeks, for gathering leaves.

OUR SILK AT THE CENTENNIAL.

At the Centennial Exhibition, held in Philadelphia in 1876, California was represented by a silk culture display. Mr. Neumann and Mrs. Keeney collected specimens of our cocoons, and took with them to the East two flags made by Mr. Neumann of American grown silk, and some skeins of reeled silk, and illustrated the industry by a display of silkworms, in their various stages of development. Our cocoons, it is said, were examined by Professor Henry, of the Smithsonian Institution at Washington, who pronounced them superior to any that he had ever seen. The President of the United States is also reported to have been so favorably impressed with the conviction that this industry should be built up in California, that he was willing to favor an appropriation of \$20,000 from the agricultural gifts to the States for the encouragement of silk culture in California. But the most happy result of the exhibit at the Centennial was the interest created in the minds of a number of influential ladies. They were subsequently induced to organize the Women's Silk Culture Association of the United States, having for its object the gratuitous dissemination of information on this subject, and the building up of

silk culture as an American industry for the benefit of American women.

CALIFORNIA SILK CULTURE ASSOCIATION.

While women at the East were moving to build up this new industry, a large number of patriotic ladies in California organized an association for the same object. It will be remembered that the years 1879 and 1880 saw thousands of our people unemployed. Men paraded the streets of our cities asking for work. Hungry women and children were begging for bread. Mrs. T. H. Hittell, of San Francisco, read a paper before the Horticultural Society, showing the importance of silk culture. Another article on the same subject, prepared by her, was read by C. A. Buckbee before the Academy of Sciences. In these discussions it was shown that the industry could be worth millions to the State, and help tens of thousands of women and girls to earn their bread. A score of patriotic ladies organized the California Silk Culture Association. Correspondence was opened with silk growers in many lands. Information was given to the people; manuals of instruction were published. Many women began the work, and in two years good cocoons had been raised in thirty-two different counties. This association found in 1882 that it needed some powerful aid. A Filature was absolutely necessary, to which the cocoons might be sent, the raw silk extracted from them, and the work of the people put in a condition suitable for manufacturing purposes.

STATE BOARD OF SILK CULTURE.

In this emergency an appeal was made to the Legislature of California. The State Government determined once more to reach forth a helping hand to this industry. It appropriated \$5,000 for the first year, and \$2,500 for the second year, and created a State Board of Silk Culture to administer the trust. This important commission was directed to establish a Filature with as little delay as possible. It began its work in May last, too late to give all the assurance to culturists throughout the State that they needed, that there would be a market for their product; but in time to remunerate all who prosecuted the work. The State Board, fortunately, is not limited to any one department of the enterprise. Whatever will contribute to encourage and establish this great industry receives encouragement. It procures seed, cuttings, and young rooted mulberry trees, and the best varieties of silkworm eggs, which it supplies gratuitously or for a nominal price, in limited quantities, to all applicants. It collects and sends abroad information of great value to the people. It has opened its

FILATURE AND SILK-REELING SCHOOL,

And given instruction in the art of reeling to eleven young ladies, who will be able next year to act as independent reelers. It is intended to educate and prepare teachers for the orphan and charitable institutions of California, so that their inmates may help to support themselves by means of silk culture and silk reeling. It is the hope of the State Board that it may be able to lay foundations for Filatures in Los Angeles, San José, Stockton, Sacramento, and perhaps other parts of the State. It has already received over five hundred pounds of cocoons, and produced about thirty pounds of beautiful silk, which

is said by manufacturers to be of an excellent quality. In addition to what has been received at the Filature, one hundred pounds of cocoons have been sent East by one of our silk raisers in San José. It is known that several hundred pounds have been raised for the production of eggs for foreign countries. We estimate that not less than one thousand five hundred pounds of cocoons were raised this year.

EXPERIMENTAL STATION.

An experimental station is one of the projects of the State Board, where mulberry trees adapted to any climate shall be planted and cultivated according to the best known principles, the different varieties of the silkworms be treated, a suitable cocoonery erected as a model for the State, and where parties wishing instruction in silk culture are to be taught in all the mystery of this wonderful industry. For such a station not less than one hundred acres, suitably located and accessible by railroad, will be requisite. Those who have a suitable tract of such land would be benefactors, not only to California but to our whole country, by donating it to the State Board for such a patriotic object. The number of persons who will enter upon the work next year is not known, but the applications for aid are many. Not less than twenty thousand cuttings and trees will be needed to supply those whose requests are already on file.

A SELF-SUSTAINING FILATURE.

The State Filature already established has two steam reels and one hand reel. It is estimated that six or eight new reels will be needed for next year's operations. Now that this institution has been established by the State, and the product of the people can be utilized, there is no reason why every farmer should not encourage his family to engage in the work. As soon as the product of the State will be sufficient to keep sixty reels in operation, the Filature will have become self-sustaining, and the generosity of the State will have made silk culture one of our most profitable industries.

AN INDUSTRY FOR WOMEN.

Silk culture is the special work of women, girls, young boys, the infirm, and aged persons. There are so few industries for women that this great enterprise would seem to be a godsend to them. We are assured that any mother, with the aid of two or three children, can earn fifty dollars in the six weeks required for raising silkworms. She can do this without interfering with her ordinary household duties. There is no hard work about it. After two or three years' successful experiments, she can increase the sum earned to two hundred or three hundred dollars. But for earning such a sum she would need the help of one or two men for a couple of weeks.

HOW TO BEGIN THE WORK.

The first thing required is to plant a few mulberry trees. The best kind is the *morus alba*, or white mulberry, of which there are many varieties. They should be set out as a hedge, about ten feet apart, near the house, around the garden, or in rows by the roadside. In

two years the first experiment in raising silk can be made. Fifty trees are enough to begin with. Cuttings are better than seed; they root easily and grow rapidly. They should be trimmed down and not allowed to grow higher than ten feet, so that the leaves can be easily picked by young persons. As the industry is to be prosecuted by women, the trees should be grown as near to the home as possible. The next step in preparation is a suitable room for a cocoonery, airy and clean. In Europe housewives often use a garret, or some other part of their houses; but it is better to have a cocoonery. A building 20x40 feet would suffice to rear 100,000 worms. The building can be used ten months in the year as a storeroom, a carriage house, or for some other farm purpose. For silk culture it would only be needed in May and June.

ADVANTAGES OF SILK CULTURE.

This industry is capable of giving employment to every unemployed woman and girl in the State. It is pleasant and profitable, and just suited to fill up leisure hours in all our rural homes. The women and children of the family can earn a nice little sum of money for themselves. They can thus contribute something to the productive wealth of the State; they can make themselves richer and their homes happier; for industrious homes are happier than the homes of the idle. Vast numbers of our boys and girls are profitably employed a few weeks in the year in fruit picking and canning, but this gives no steady work. When silk culture becomes general in the State it will give work for two months to all these idle hands. Then when the canning season is over, the rest of the year can be profitably employed in silk reeling, either at home, or in some Filature; for Filatures must eventually become established institutions in different parts of the State, in which tens of thousands of our daughters will find permanent, pleasant, and profitable employment. The best ladies in France and other European countries may be found engaged in silk culture every year. France and Italy make nearly one hundred millions of dollars annually by this industry; and nearly all the work is performed by women and young people. The demand for raw silk is immense. The manufactories of the world require about four hundred million dollars worth every year, and this demand is increasing. The factories in the United States produce eighty million dollars worth of silk fabrics annually.

OUR AMERICAN SILKS

Are becoming popular in Europe, and California-grown silk is attracting favorable attention in all parts of the civilized world. The women of the State have it in their power to make California a leading silk producing country. In doing so they can earn many millions of dollars. We can raise all the raw silk that our American manufactories need and help to supply the looms of other countries. A letter from an old silk grower in Philadelphia shows that the people of the East expect great things from our State. It is the first State in the Union to provide a Filature and a market for the people. It is the first State in the Union whose Legislature has recognized the great truth that Government should intelligently help to establish such an industry as this, for the sake of giving work to its women, and em-

ployment to its unemployed. The small sum invested by the State will soon be returned to it in the increase of taxable property in the hands of its prosperous citizens. It is cheaper to give employment to the people than to be compelled to support them in jails, or poor-houses, for want of work. If those who have begun will persevere, and others who have become interested will now enter upon the work, it will not be long before the women of the Golden State will be earning several millions of dollars a year by means of silk culture.

SILK MANUFACTURES.

The manufacture of silk fabrics has now become an established fact in California. Efforts in this direction were made nearly twenty years ago. But the early projectors failed. In 1871 a company was projected in Alameda County for silk culture and manufacture. The stock was to be \$1,500,000. Four years before this an effort was made in Santa Clara County to secure \$250,000 for silk manufacturing by a stock company, and a year later another company was projected for the same purpose, with a capital of \$100,000. None of these stock companies succeeded; but they called attention to the subject, and subsequent efforts by individuals met with better results. There are now

TWO SILK FACTORIES IN CALIFORNIA,

Both doing a good and growing business—one is located at San Francisco, the other at San José. The establishment at San Francisco is managed by Messrs. Carlson & Currier, for the production of Belding's and California silks. It is really the successor to a stock company that began operations in 1870 by the erection of a mill at South San Francisco for making spool, skein, tram, embroidery, etc. After a short run the company became involved, and disposed of all its interest to Rodgers, Meyer & Co., by whom the work was continued with various success until June, 1882, when their works were totally destroyed by fire. Carlson & Currier, representing Belding Bros., purchased the goods and good will of Rodgers, Meyer & Co., and soon after erected a full-fledged silk mill. It has been in successful operation since February last, and is located at the corner of Stevenson and Ecker Streets, in the heart of San Francisco. It gives employment to forty persons—mostly girls and boys. We understand that the machinery and appliances of the establishment are worth about \$10,000; but the purpose is to erect a large and suitable building, as soon as the demand for their goods will justify it, for making twisted or spooled silk, ribbons, and other fabrics. The pay-roll of the factory is about \$1,000 a month; a ready market is found for all that is produced. Like all new undertakings difficulties have to be overcome; but there is a powerful house to back it. Belding Bros. are owners of the famous mills at Northampton, Massachusetts, and at Montreal, Canada. They are determined to render all aid needful for success to the young factory in San Francisco, whose goods are sought for, not alone on the Pacific Coast, but also in Mexico, Honolulu, and Australia. There is a spice of patriotism in this firm that is refreshing. They know that the wealth of a State depends upon what it produces. They are so anxious for the success of silk culture in California that they are willing to pay twenty-five per cent above

the highest market price for the next three years for all raw silk of California growth that is suitable to their uses.

SILK DRESS GOODS.

The San José Silk Factory confines its work to dress silks. It is owned by two experienced silk-workers—A. F. Saufrignon and H. X. Van de Castele. A stock company began the enterprise and failed. These two gentlemen took hold of the business in the beginning of 1883, and have succeeded. They are working ten looms, employ from ten to twenty hands, and are now finishing from sixty to seventy yards of dress goods every day. Stores in Sacramento, Marysville, Stockton, Los Angeles, San José, Merced, and Salinas, find their goods popular. A firm in San Francisco is about to introduce these beautiful fabrics to its customers in the metropolis. These gentlemen say they are satisfied with their success. They are building up a reputation for honest silks, giving employment to our own boys and girls, and believe there is a grand future for the silk industry in California.

WILL SILK CULTURE PAY?

AN ADDRESS BY C. A. BUCKBEE, PRESIDENT OF THE BOARD, DELIVERED AT THE MEETING IN
SEPTEMBER, 1883.

This question is so frequently asked that I deem it important to submit a few facts, which will enable the people to answer it for themselves. This industry relates to the rearing of silkworms and the production of their cocoons. In other countries where this has become an established industry, the work is very largely done by women, young girls, children, the aged, and the infirm. Men have little to do with it except during the very busy period of eight or ten days, and then only when an unusually large number of silkworms are raised. Five or six boys and girls in a family with the mother's superintendence can raise several hundred dollars' worth of cocoons. Under very favorable conditions, with the help of four or five men for eight or ten days, they could earn from five hundred to one thousand dollars, and perhaps even more. By favorable conditions, we mean the best mulberry trees near the house, the best silkworm eggs, a suitable cocoonery, knowledge of the work required, and careful attention, by all the workers.

Fifty trees are enough to begin with; ten or twenty will suffice for the first experiment. With two hundred trees from two to five years old, a family can make a good showing from the very first with intelligent effort. After the trees are sufficiently grown, any lady, with the help of one or two children, can earn at first, say fifty dollars, then seventy-five or one hundred, and then two or even three hundred dollars. The work required need not materially interfere

with her ordinary household duties. The husband and grown up sons may all the time be attending to their regular farm or other avocations, while the wife and mother is thus making a few hundred dollars as her contribution to the family income. The time required from the hatching of the silkworms to the completion of their cocoons is about six weeks. Three weeks more may be required to dry and fit the cocoons for the filature. In three months the work is all done, and the earned money is in the mother's hands.

When the industry has been thus successfully begun it can be extended within reasonable limits, without any great expense. Other trees can be propagated from cuttings. If the farmer can set apart five acres for a mulberry grove near the house, two thousand trees can be grown. They will soon yield leaves enough to produce two or three thousand pounds of cocoons, and this is as much as any family should attempt. If the land cannot be spared for a mulberry grove, then the trees can be planted by the roadside, around the garden, or on the line of fences between the fields. In the latter case they should be grown as a hedge. This method of growing the mulberry tree is now very popular in Kansas, and in many places in Europe. In this way they will take up no room that may be needed for other purposes. Such a number of mulberry trees (2,000) would be valuable for many purposes besides silk culture; they would beautify the home and greatly benefit the country, where we know there is a serious lack of really useful trees.

We do not recommend the farmer to give up his fruit orchard, his vineyard, or his wheat fields, in order to make silk culture his chief industry. The experience of culturists in Europe, so far as we are informed, is such that failure may be expected when the work is attempted on a scale beyond the ability of the women and young persons in the family to superintend and perform most of the labor required. Again and again we repeat: let silk culture be a household industry, performed mostly by women and children. We advise no one to attempt more than this.

STOCK COMPANIES WILL FAIL.

Stock companies organized for silk culture almost always fail. Large mulberry groves, large and crowded coconeries, managed by superintendents, agents, clerks, and secretaries, and the work performed by a large force of laborers, for the benefit of absent stockholders, have never paid, and they probably never will. In all its history thus far silk culture has defied corporations. Whenever they touch it to make money, they fail; but left to intelligent and industrious women, as a home employment, it yields a generous reward.

There is something in silk culture that seems to make it peculiarly fitted for woman. The gentleness and tenderness required in the nurture of the silkworm appeals to her motherly instinct. The patient care that must be exercised for the new-born child is not greater than that which must be given to the successful rearing of that most precious of all insects—the silkworm. It is the creature of a day. From the hour of its birth until it is ready to spin its cocoon it needs the care of a mother; and then, while for eight days it is spinning its life out in one unbroken thread of silk, over one thousand feet long, it must be guarded with a watchfulness equal to that which mothers show for their helpless children. It works for a

woman; the product of its life is for her richest adornment. There is no material more durable or becoming, nothing richer in all her wardrobe than the silk fabric, produced for her use and comfort by an insect whose existence is a revelation of infinite wisdom in its Creator. Its whole life from birth to death is less than fifty days. At first it is so small that you can scarcely see it with the naked eye. It has its periods for eating and resting. Four times it throws off entirely its outer covering, and finally it becomes a beautiful pearl-colored silkworm, three or four inches long, as thick as a lady's finger, and its body so transparent that you can almost see through it. Thus fully grown, it seeks a secure resting place, where it spins its thread in concentric circles, forming three distinct layers around itself. It shuts itself up in the cocoon, as in a tomb, which is secured as perfectly as was the tomb of the Nazarene by the seal of the Roman Empire. In this tomb it undergoes a marvelous change, and at the end of three times three days, very early in the morning, it comes forth from its sepulcher a beautiful butterfly, an emblem of man's deliverance from the grave.

SILK CULTURE AN EDUCATION.

Everything in the birth, life, and work of the silkworm is wonderful. Its care is peculiarly adapted to women. To children it is a book more fascinating than the *Tales of the Arabian Nights*; for them it is an education; and it seems strange that in our intensely practical age school boards and teachers do not give some attention to this study. In addition to being taught some of the greatest wonders of creation, children would easily acquire the knowledge of an industry by which they could help to earn their own living. It would help to solve the oft repeated question, "What shall we do with our children? What can they do when they leave the school room?" The farmer's daughter who understands silk culture need not leave her father's home to find work in the city in the endeavor to support herself. With this industry understood, she can earn more in six weeks at home than she could probably save from her earnings in six years by work in the city.

Our cities are already overcrowded. There are more women in them than there is work for them to do. The social dangers in the city are great. Parents ought to provide, if possible, suitable employment at home for their grown-up children. In silk culture our daughters will find a beautiful, attractive, and profitable industry.

SILK CULTURE AND MANUFACTURERS.

The manufacturers of the United States now use more than one million dollars' worth of raw silk every month. Some have put the amount as high as two millions and a half a month, equal to thirty millions a year; but this is probably a mistake. The amount of raw silk, however, needed by manufacturers, is increasing very rapidly. It will not be long before it will reach fifty millions a year; and where is it to come from? At present the amount required is mostly imported from foreign lands. Our country is sending abroad more than a million dollars every month which might just as well remain in the hands of American women.

It is known now for a certainty that all the raw silk needed in the

United States could easily be raised in California. On account of our equable climate, rich soil, and freedom from rain and thunder storms, California is really one of the best silk-growing countries on the face of the earth. In France forty million dollars a year are earned by the women from silk culture. The women of Italy, many of them, depend on it for their living. The women of Lombardy, that small province of Southern Europe, export thirty million dollars' worth of raw silk annually, after supplying all that is needed for the home market; and the silk manufacturing interest in Lombardy is immense.

Some of the wives and daughters of the nobility in Europe have their royal cocoeneries, and every year, in the month of May, ladies of high rank, with their maids, are as busy in the work of silk culture as the poorest of their neighbors. Silk culture pays these ladies of rank. It pays them in happiness as well as in money, for there is always happiness in any appropriate and useful employment, and it will pay the women of California—our wealthy ladies as well as their poorer sisters—to engage in this healthful and beautiful home industry.

FALSE HOPES DISCOURAGED.

We cannot hold out hopes as to great profits and immense fortunes from silk culture. Men must not be carried away and deluded by a speculative fever in this matter. They can do a great good for themselves, their families, and the country, if they will act soberly and wisely. As men they have a duty to discharge without which their families are helpless; and the sooner they act the sooner will the blessings of silk culture be secured. It is their duty to plant good mulberry trees around their homes. Then let them hand the industry over to the women and children of their households. Those who do so will make it possible for their families to contribute materially to the prosperity and happiness of what to them is the dearest spot on earth; for

"Be it ever so humble, there is no place like home."

CAN CALIFORNIA WOMEN SUCCEED?

The first question with California women will be this: "Can we succeed?" Why should you not? What is to hinder? You have the best climate and soil in the world for silk culture. Are you ignorant of the nature of the industry? Others, who once knew as little about it as you do now, obtained the information very readily; and now they are successful, and delighted with the work. Women in France are successful. The peasant women of Italy, who are far from possessing the gifts and quick intelligence of California ladies—they have succeeded; and it is worth millions of dollars to them. In some of the Eastern States women have succeeded. The aged mother of the lamented Bayard Taylor is a noted illustration of what the aged can do; for she has obtained an honorable prize for silk of her own production. In our own State the witnesses are many. We could call them from nearly every part of California: Miss Julia B. Farnsworth, and Mrs. Dr. Babb, of San José; Mrs. E. P. Keeney, when she resided in Nevada City; Mrs. H. C. Downing, of San Rafael; Mrs. Jeanne C. Carr, of Los Angeles County; the late Mrs. Sellers, of Antioch, Contra Costa County; Mrs. W. B. Bourn, of St. Helena, Napa County; Mrs.

Garbarini, of Amador County; Mrs. L. P. Turner, of Amador City; Mrs. C. Dodson, of Tehama County—all these, and many others, have succeeded in silk culture. Why cannot the women in every family do as well as they have done? They can do so. The Governor and Legislature of our State are very solicitous for the success of this industry. Aid is most generously extended to assist the women of our State. For this very purpose the State Board of Silk Culture has been created. Its duty is to provide instruction, secure the best trees and silkworm eggs, and to take all the silk cocoons that our people can produce. It is authorized to pay for these cocoons as good a price as they could command in the best market in the world. A Filature is established for the benefit of all. Here the cocoons can be reeled; and here our daughters may be instructed in this department of the silk industry.

What, then, is to prevent success? The work is easy and the burden is light. It gives employment for the idle; it brings to our homes a profitable work for leisure hours. It makes home happy by giving all something to do. It will help to clothe the family; it will secure very many comforts; it will give light work to young boys, by which they can earn a little money; it will give to our daughters such a spirit of self-dependence as will increase their womanly worth; and it will not interfere with any farm work or household duty.

The busy season in silk culture is all over before the time for haying and harvesting. The cocoons are all out of the way before the cherries are ripe or other fruits need to be gathered for the market.

Success is certain for those who patiently and intelligently prosecute this most beautiful and becoming of all our home industries; its rewards are sure. The women of the State will be the richest gainers, but all will share in its benefits.

IT WILL PAY.

It will pay the husband and father to help his wife and children to engage in silk culture by planting a few trees for their use. It will pay the philanthropist to foster silk culture; for it will provide employment for many who are now idle in the country and in the city. It will pay the State to add silk culture to its other industries; for it will make its citizens richer. It will pay our country to see that silk culture is extended to every agricultural family in the land; for it will keep at home, among the people, many millions of dollars every year, that we are now sending abroad to purchase what we could easily ourselves produce.

With such blessings now within our reach, it will be unpatriotic—it will be an inexcusable indifference—for any one, rich or poor, to neglect this golden opportunity of helping to make silk culture one of the favored industries of California.

SILK MANUFACTURERS.

ADDRESS BY EDWARD CARLSON, DELIVERED AT THE FIRST ANNUAL MEETING OF THE STATE BOARD OF SILK CULTURE, SAN FRANCISCO, NOVEMBER 2, 1883.

The silk industry may be divided into four parts: First, there is the raising of the worm and cocoons; then the filature or reeling; next, the manufacturing; and last, but not least, the consumption of the different products of that industry. As you are aware, I belong to the third, or

MANUFACTURING CLASS,

And therefore crave your pardon if, for a few moments, I dwell upon that part of the work. When a lady uses a spool of silk, she, perhaps, does not consider what labor it takes before a thread of the desired color and size has been obtained, and how many nimble fingers have handled it before it is put to its final use. You are familiar with the process of reeling; you know it takes from five to ten cocoons to form the threads which compose what is known and sold as raw silk. Now, taking for granted that we want to make what is called "A" silk, that being the size which is mostly used, we take four or five skeins of this raw silk, and, after soaking them over night in soapsuds, wind them on separate bobbins; then they are doubled; these doubled threads are then spun for the first time. Three of these twisted strands, or cords, are matched, from which matching they pass again to the spinner, by whom they are spun the second and reverse way. From the hands of the spinner they go to the stretcher; then to the reeler; from there to the boiling-off and dye house, where, through the dyer's skill, all the delicate shades which change, fashion, and you ladies, require, are obtained. After returning from the dye house, it passes to the parting stick, to the soft winder, cleaning room, and finally to the spooler, from whose skillful hands it passes ready for the market. You observe that it requires from sixty to one hundred of these fine threads which the worm originally spins, and the handiwork of fifteen different operators, besides those engaged in making the spools and paper boxes, before such an insignificant article as a spool of silk can be produced. I have dwelt upon this subject to show what an opening it affords—how many hands are needed, and to how many mouths it can furnish bread and butter.

We read in Holy Writ that silk garments were worn one thousand years before the date of the New Testament; and Chinese tradition goes still further back, and claims that the art of weaving silk was known two thousand seven hundred years before the Christian era. If we take this into consideration the silk industry of these United States is but in its infancy, although for an infant it is of a very healthy growth, and must have been nourished by Brother Jonathan in a most liberal manner, for statistics prove that while in 1850 we had only twenty-nine establishments, with a capital of \$434,000,

giving employment to eight hundred and fifty-seven hands, in 1880 we had three hundred and eighty-three establishments with a capital of over \$20,000,000, giving employment to more than thirty-two thousand hands, receiving for their wages \$9,000,000 per year. You see therefore, at a glance, that if we judge the future from the past, to what a

STUPENDOUS INDUSTRY

The production of silk may grow; more so when it is estimated that the world's annual product is over \$400,000,000, and gives employment to over five hundred thousand operatives.

The importation of raw silk for the fiscal year ending June 30, 1883, was \$14,687,584. Of this amount very little has found its way to our own State. We estimate that about \$300,000 worth of twisted or spool silk alone is sold in this market; and if all were made here it would furnish employment for a large number of boys and girls. And let me say right here, that as far as our experience goes, our

OPERATIVES IN CALIFORNIA

Compare more than favorably with those in the older States. We have found them in every respect intelligent, industrious, and trustworthy; they require ordinarily from two to three years to become good spoolers; the other work is more readily learned, the labor is not hard, and in no way injurious to health. We have a great many more applications than places. We would be glad to give employment to all who desire work. It is our intention to add machinery as fast as the occasion requires the increase, and hope that in the near future we will not alone look to California for our operatives, but also for our raw material.

The question has often been asked why raw silk is so low and manufactured goods comparatively high? It may not be generally known that in manufacturing from imported silk there is a loss of over forty per cent. There is alone twenty-five per cent gum in the fiber, which must be carefully extracted before dyeing; the other fifteen per cent loss is the result of waste in the different processes through which the silk passes in manufacturing.

Twisted silks are used in a great many different ways; in sewing ladies' and gentlemen's garments; in the manufacture of boots, shoes, harness, and other leather goods; in fancy work; in dentistry and surgery; yes, even in the making of flour the silkworm has to give his aid.

We have made a display of samples showing the process of making spool, skein, embroidery, and knitting silk, among which are some spools made from cocoons grown and reeled in California. We have so far worked too small a quantity to determine the exact values, but from the little that we have handled we judge it to be of

VERY FINE QUALITY.

We shall be pleased to work a larger lot and test it thoroughly. Some one has said that he who makes two blades of grass to grow where only one grew before, is a public benefactor. Those who open up new industries, as you are doing, deserve the highest praise. Like every crop in California, that of children is very prolific. We must

find work for their idle hands to do. You must not look at first for great results from your labors. Let those who plant the mulberry remember the date palm. The child may plant the seed, the matron may not reap the fruit.

You have illustrated that good cocoons can be grown in California, and that they produce fine silk, and if, through your perseverance and with the employment of competent instructors, you add a new production to the many advantages of California, you can be proud to write the word "Success" upon your silken banner.

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FIRST BIENNIAL REPORT
OF THE
STATE BOARD OF SILK CULTURE
OF
CALIFORNIA
FOR THE YEARS 1883 AND 1884.

OFFICE:
No. 40 California Street, Room No. 7, San Francisco, California.



SACRAMENTO:
STATE OFFICE JAMES J. AYERS, SUPT. STATE PRINTING.
1884.

MEMBERS OF THE STATE BOARD OF SILK CULTURE.

FOR THE TERM OF TWO YEARS.

DR. C. A. BUCKBEE	804 Turk Street, San Francisco
MRS. JEANNE C. CARR	Pasadena, Los Angeles County
W. B. EWER	414 Clay Street, San Francisco
R. J. TRUMBULL	419 Sansome Street, San Francisco

FOR THE TERM OF FOUR YEARS.

MRS. E. B. BARKER	No. 14 Stanley Place, San Francisco
PROF. E. W. HILGARD	Berkeley, Alameda County
MRS. T. H. HITTELL	No. 808 Turk Street, San Francisco
MRS. FLORA M. KIMBALL	National City, San Diego County
MRS. H. B. WILLIAMS	319 First Street, San Francisco

OFFICERS.

DR. C. A. BUCKBEE	President
PROF. E. W. HILGARD	First Vice-President
MRS. T. H. HITTELL	Second Vice-President
MRS. JEANNE C. CARR	Third Vice-President
W. B. EWER	Treasurer
MRS. S. A. RAYMOND	Secretary

STANDING COMMITTEES.

EXECUTIVE—Mrs. E. B. Barker, W. B. Ewer, Mrs. T. H. Hittell, Mrs. H. B. Williams, the President, ex officio.

FINANCE—R. J. Trumbull, E. W. Hilgard, W. B. Ewer.

FILATURE—Mrs. T. H. Hittell, R. J. Trumbull, W. B. Ewer, Mrs. H. B. Williams.

COCOONS AND TREES—Mrs. E. B. Barker, W. B. Ewer, Mrs. L. Rienzi.

LIBRARY AND PUBLICATIONS—Mrs. H. B. Williams, Mrs. T. H. Hittell, Mrs. S. A. Raymond, Mrs. L. DeF. Gordon.

HEALTH AND SILKWORM EGGS—Prof. E. W. Hilgard, Mrs. T. H. Hittell, J. J. Rivers, Dr. W. P. Gibbons.

OFFICE AND FILATURE.

The office of the Board is located at No. 40 California Street, San Francisco, Room 7. Open daily from 9.30 A. M. to 4 P. M.

The Filature for silk reeling and instruction will be reopened as soon as possible.

CORRESPONDENCE.

Correspondence relating to the specific work of any of the standing committees should be addressed to the Chairman of the committee to which it refers.

All other correspondence should be addressed to the "State Board of Silk Culture, 40 California Street, San Francisco, Room 7," where the Secretary may be consulted on matters relating to silk culture.

MEETINGS.

The Board meets at 40 California Street, for the transaction of business, on the last Thursday of every month, at 2 P. M.

The annual meeting occurs on the first Friday in November.

All meetings of the Board are open to the public.

REPORT OF THE FINANCE COMMITTEE.

The Finance Committee has met statedly every month, since the organization of the Board. All bills have been separately examined, and found to be correct. The aggregate of the bills thus examined and approved by the Board, for the period commencing May 10, 1883, and ended November 1, 1884, amounts to seven thousand four hundred and ninety-nine dollars and sixty-four cents, for which sum warrants were issued upon the State Treasurer by the Controller of the State, and all the claims have been duly paid by the Treasurer of the Board, for which he holds properly receipted bills, as per the accompanying schedule of "Bills Incurred and Paid."

From the books of account the committee has made a careful classification of expenditures, to November 1, 1884, as follows:

Office and General Expenses.

Salary of Secretary	\$1,335 13	
Rent of office	120 00	
Furniture, stationery, and library	481 89	
Fuel, postage, expressage, etc.	362 15	
	\$2,299 17	

Filature Expenses.

Salary of Superintendent	\$1,163 50	
Rent, steam power, and water	389 15	
Reelers and helper	492 92	
Furniture, machine work, etc.	700 10	
Cocoons and cocoon jars	1,071 48	
	3,817 15	

Silkworm Eggs and Trees.

Silkworm eggs	\$170 10	
Mulberry trees, cuttings, and seed	239 37	
	409 47	

Fair Exhibits, Instruction, Premiums, etc.

Boxes for spooled silk	\$34 00	
Fair exhibits and public meetings	433 99	
Oakland, silk culture instruction	40 00	
San Rafael, silk culture school	295 86	
Premiums for prize cocoons	170 00	
	973 85	
Total	\$7,499 64	

BILLS INCURRED AND PAID DURING THE FIRST YEAR.

Bill.	NAME OF CLAIMANT.	Description of Bills.	Amount.
1	Mrs. E. P. Keeney, Secretary	Salary	\$52 63
3	Mrs. E. P. Keeney, Secretary	Postage and expressage	53 53
4	Frank G. Edwards	Furniture for office	132 52
5	Cunningham, Curtis & Co.	Stationery	77 85
6	Holbrook, Merrill & Stetson	Stove and fixtures	20 00
7	L. & E. Emanuel	Furniture for office	77 00
8	T. D. Cromz	Repairing office desk	4 00
9	J. Vollmar	Furniture for office	18 00
10	Sanborn, Vail & Co.	Frame, Filature furniture	3 60
11	Wangenheim, Sternheim & Co.	Cocoon jars	7 67
12	Wm. C. Wyckoff	Books for library	5 00
13	Mrs. E. P. Keeney, Secretary	Salary	75 00
14	Frank Keeney	Assistance at the office	10 00
15	West Coast Furniture Man'g Co.	Office furniture	54 00
16	R. J. Trumbull, Treasurer	Cocoons	125 00
17	Mrs. E. P. Keeney, Secretary	Postage and expressage	13 77
18	Mrs. E. B. Barker	Furniture for office	6 00
19	Dewey & Co.	Expressage on cocoons	5 75
20	American Silk Culturist	Books for library	3 50
21	Davis Brothers	Office furniture	2 50
22	H. S. Crocker & Co.	Multiplex letter press	3 25
23	F. S. Chadburne	Office furniture	35 00
24	Mrs. E. P. Keeney, Secretary	Salary	75 00
25	Mrs. E. P. Keeney, Secretary	Postage and expressage	14 34
26	The Grangers' Bank	Rent of office	45 00
27	Committee on Cocoons.	Help in sorting cocoons	10 50
28	Renton Coal Company	Coal for office	1 40
29	Holbrook, Merrill & Stetson	Coal scuttle for office	70
30	Wm. Little	Wood and coal box for office	5 50
31	Frank G. Edwards	Oilcloth for office	1 00
32	R. J. Trumbull, Treasurer	Cocoons	144 25
33	C. A. Buckbee, President	Silkworm eggs	25 00
34	L. & E. Emanuel	Office furniture	5 00
35	N. Y. Silk Exchange	Silk Culture Magazine	1 00
36	Mrs. T. H. Hittell	Silkworm eggs	35 00
37	Mrs. E. P. Keeney, Secretary	Salary	75 00
38	J. O'Connell	Lettering office door	5 00
39	N. P. Cole & Co.	Furniture for Filature	52 50
40	Com. Steam Power Works	Steam for Filature	15 00
41	Alex. Mackay	Furniture for Filature	90 80
42	Woman's Silk Culture Association	Hand reel for Filature	20 00
43	Mrs. S. A. Raymond, Treasurer	Filature furnishing	29 90
44	Mrs. E. P. Keeney, Secretary	Postage and expressage	19 33
45	R. J. Trumbull, Treasurer	Sundry Filature expenses	29 80
46	Bertin & Lepori	Rent of Filature and water	52 50
47	C. A. Buckbee, President	Postage, expressage, etc.	11 62
48	Paul Consonno, Superintendent	Salary	113 50
49	Josephine Soldavini	Wages as reeler	32 50
50	B. F. Sterett	Ten thousand spool labels	20 00
51	Galli & Co.	Machinery for Filature	140 00
52	J. Caire	Silk scales for Filature	10 00
53	Cunningham, Curtis & Welch	Illustrations of silk weighing	90
54	August Pistolisi	Alcohol and benzine	1 90
55	Swan, the painter	Cloth sign	2 50
56	Mrs. J. E. McEwen	Boxes for spooled silk	1 50
57	Wenpe Brothers	Boxes for spooled silk	12 50
58	B. F. Sterett	Display cards for fairs	4 00
59	Mrs. S. A. Raymond	Expenses of State Fair exhibit	51 50
60	Mrs. S. A. Raymond	Trees distributed, postage, etc.	61 07
61	Mrs. S. A. Raymond	Cocoons, etc.	80 60
62	Wangenheim, Sternheim & Co.	Cocoon jars	4 00
63	Bertin & Lepori	Rent of Filature and water	27 50
64	C. A. Buckbee, President	Telegrams, drayage, etc.	3 41
65	Mrs. L. De F. Gordon	San Joaquin Valley Fair exhibit	68 80
66	Paul Rusconi	Helper in Filature	22 50
67	Paul Consonno, Superintendent	Salary and drayage	75 50
68	Mrs. E. P. Keeney, Secretary	Postage, expressage, etc.	14 23

BILLS INCURRED AND PAID DURING THE FIRST YEAR—Continued.

BILL.	NAME OF CLAIMANT.	Description of Bills.	Amount.
69	Mrs. E. P. Keeney, Secretary	Salary	\$75 00
70	Mrs. H. B. Williams	Sundries for fair exhibits	1 50
71	Paul Consonno, Superintendent	Expenses for exhibit at State Fair	54 70
72	Josephine Soldavini	Wages as reeler	31 25
73	R. J. Trumbull, Treasurer	For premiums for cocoons (1883)	170 00
74	Bertin & Lepori	Rent of Filature and water	27 50
75	Paul Consonno, Superintendent	Salary	75 00
76	Josephine Soldavini	Wages as reeler	36 25
77	Paul Rusconi	Wages as helper	21 66
78	Shepard Brothers	Plumbing at Filature	29 90
79	Shepard Brothers	Plumbing at Filature	24 10
80	Com. Steam Power Works	Steam at Filature	20 00
81	Joseph Gamboni	Removing refuse	3 50
82	Mrs. H. B. Williams	Curtains for Filature	1 15
83	Wangenheim, Sternheim & Co.	Cocoon jars	1 50
84	Mrs. E. P. Keeney, Secretary	Salary	75 00
85	Mrs. E. P. Keeney, Secretary	Postage, traveling expenses, etc.	24 55
86	C. A. Buckbee, President	Telegrams, postage, etc.	6 42
87	S. McBirney	Rent of Dashaway Hall, anniversary	31 00
88	The Grangers' Bank	Rent of office	75 00
89	Mrs. E. P. Keeney, Secretary	Salary to November 3	7 50
90	Mrs. E. B. Barker	Cocoons and expressage	180 41
91	Mrs. S. A. Raymond, Secretary	Salary	75 00
92	Mrs. S. A. Raymond, Secretary	Expressage and postage	6 25
93	Paul Consonno, Superintendent	Salary	75 00
94	Paul Consonno, Superintendent	Expenses to Brentwood	5 50
95	J. J. Bruni	Removal of refuse	1 00
96	Paul Rusconi, helper	Wages at Filature	21 66
97	R. J. Trumbull, Treasurer	Sundry Filature expenses	13 40
98	A. Getz	Painting at Filature	7 50
99	Bertin & Lepori	Rent of Filature and water	27 50
100	A. Denari	Hardware for Filature	1 60
101	J. Meissner	Carpenter work at Filature	5 00
102	Josephine Soldavini	Wages as reeler	32 50
103	Galli & Co.	Machine work at Filature	17 25
104	Paul Consonno, Superintendent	Sundry supplies at Filature	11 00
105	Mrs. E. B. Barker	Cocoons purchased	11 43
106	Mrs. S. A. Raymond, Secretary	Salary	75 00
107	Mrs. S. A. Raymond, Secretary	Fuel, postage, expressage, etc.	13 65
108	Bertin & Lepori	Rent of Filature and water	27 50
109	Shepard Brothers	Plumbing at Filature	16 50
110	H. J. Huick	Supplies at Filature	2 50
111	Paul Consonno, Superintendent	Salary	75 00
112	Paul Consonno, Superintendent	Silk worm eggs and expressage	32 20
113	Paul Rusconi	Wages as helper	21 70
114	Josephine Soldavini	Wages as reeler	32 50
115	J. Bruni	Removal of refuse	1 00
116	Mrs. E. B. Barker	Cocoons and expressage	21 82
117	Mrs. S. A. Raymond, Secretary	Salary	75 00
118	Mrs. S. A. Raymond, Secretary	Postage, fuel, and expressage	21 90
119	Cunningham, Curtis & Welch	Ink, sponge cup, scales, etc.	4 00
120	Paul Consonno, Superintendent	Salary and Filature expenses	77 15
121	Bertin & Lepori	Damages on merchandise	60 00
122	Bertin & Lepori	Rent and water	27 50
123	Josephine Soldavini	Wages as reeler	32 50
124	Paul Rusconi	Wages as helper	21 65
125	N. P. Cole & Co.	Walnut-wood pole	1 50
126	Wangenheim, Sternheim & Co.	Glass jars	2 40
127	Holbrook, Merrill & Stetson	Repairing stove and pipe	2 12
128	Commercial Steam-power Works	Steam and power, three months	30 00
129	California Patron	Four hundred copies of February 2	8 00
130	Mrs. E. B. Barker	Mulberry trees	19 00
131	Mrs. S. A. Raymond, Secretary	Salary	75 00
132	Mrs. Eleanor Cramer	One and one quarter pounds of cocoons	1 25
133	Mrs. J. R. Lawrie	Five thousand mulberry cuttings	20 00
134	Bertin & Lepori	Rent and water at Filature	27 50
135	Paul Consonno, Superintendent	Salary and Filature expenses	90 00

BILLS INCURRED AND PAID DURING THE FIRST YEAR—Continued.

Bill.	NAME OF CLAIMANT.	Description of Bills.	Amount.
136	J. J. Bruni	Cartage	\$1 00
137	Josephine Soldavini	Wages as reeler	31 25
138	Mrs. S. A. Raymond, Secretary	Postage, expressage, etc.	45 30
139	Paul Rusconi	Wages as helper at Filature	21 00
140	Paul Consonno, Superintendent	Salary	75 00
141	Paul Consonno, Superintendent	Silk worm preservative and expenses	15 75
142	Josephine Soldavini	Wages as reeler	10 00
143	Paul Rusconi	Wages as helper	21 70
144	Shepard Bros.	Plumbing	9 00
145	Bartling & Kimball	Binding	4 00
146	R. J. Trumbull & Co.	Mulberry trees	133 80
147	Mrs. S. A. Raymond, Secretary	Salary	75 00
148	H. Davis	Drayage	5 75
149	Mrs. S. A. Raymond, Secretary	Postage and expressage	19 25
150	E. T. Anthony & Co.	Packing cocoons for Philadelphia	32 40
	Total for first year		\$4,999 64

BILLS INCURRED AND PAID DURING SECOND YEAR TO NOVEMBER, 1884.

Bill.	NAME OF CLAIMANT.	Description of Bills.	Amount.
1	Dr. Hermann Behr	Microscopical examination of eggs	\$50 00
2	Paul Consonno, Superintendent	Salary	75 00
3	W. B. Ewer	Money advanced to pay reelers	9 80
4	Mrs. E. B. Barker	Cocoons	9 00
5	Mrs. S. A. Raymond, Secretary	Salary	75 00
6	Mrs. S. A. Raymond, Secretary	Postage, expressage, etc.	17 55
7	Paul Consonno, Superintendent	Salary	75 00
8	Mrs. S. A. Raymond, Secretary	Salary	75 00
9	Mrs. S. A. Raymond, Secretary	Postage, expressage, and office expenses	31 40
10	Felix Gillet	Silk worm eggs	2 00
11	W. B. Ewer	Payment on cocoons	100 00
12	Paul Consonno, Superintendent	Salary	75 00
13	Mrs. S. A. Raymond, Secretary	Salary	75 00
14	Mrs. S. A. Raymond, Secretary	Postage, expressage, etc.	16 65
15	John G. Ills	Rent of Filature	40 00
16	Paul Consonno, Superintendent	Salary	75 00
17	Paul Consonno, Superintendent	Expenses of silk culture school	254 91
18	Mrs. S. A. Raymond, Secretary	Salary	75 00
19	Mrs. S. A. Raymond, Secretary	Postage and expressage	6 65
20	Alexander Mackey	Oilcloth at Filature	5 00
21	H. Davis	Moving Filature furniture	4 00
22	John G. Ills	Rent of Filature	40 00
23	Galli & Co.	Taking down machinery	48 50
24	Galli & Co.	Repairing steam-reel	6 00
25	Paul Consonno, Superintendent	Salary	75 00
26	Paul Consonno, Superintendent	Articles for use at Filature	5 45
27	H. Davis	Expressage, wharfage, etc.	5 95
28	Mrs. S. A. Raymond, Secretary	Salary	75 00
29	Mrs. S. A. Raymond, Secretary	Postage, expressage, and office expenses	10 15
30	Josephine Soldavini	Wages as reeler	38 00
31	Lucie Hermann	Wages as reeler	18 00
32	Mrs. E. B. Barker	Cocoons	307 25
33	J. J. Bruni	Cartage	1 50
34	Mrs. B. Hermann	To pay for leaves and telegrams	9 50
35	Isaac Shaver	Rent of cocoonery	29 00
36	B. H. Carter	Instruction in silk culture	40 00
37	Daily Examiner	Two months' subscription	1 30
38	Miss Lucie Hermann	Wages as reeler	9 00
39	Mrs. Josephine Soldavini	Wages as reeler	27 50

BILLS INCURRED AND PAID DURING SECOND YEAR TO NOVEMBER, 1884—Continued.

BILL.	NAME OF CLAIMANT.	Description of Bills.	Amount.
40	Paul Consonno, Superintendent	Salary	\$75 00
41	Mrs. S. A. Raymond, Secretary	Salary	75 00
42	Mrs. S. A. Raymond, Secretary	Postage and expressage	5 10
43	Mrs. S. A. Raymond, Secretary	State Fair expenses	209 66
44	Galli & Co.	Taking down steam fixtures	12 25
45	Mrs. E. B. Barker	Cocoons	28 65
46	Mrs. S. A. Raymond, Secretary	Salary	75 00
47	Mrs. S. A. Raymond, Secretary	Postage, expressage, and office expenses	10 13
48	John J. Ills	Rent of Filature	26 65
49	Paul Consonno, Superintendent	Salary	75 00
50	Bartling & Kimball	Binding	2 00
51	H. Davis	Carting furniture and machinery	11 50
Total for second year			\$2,500 00
Total for first year			4,999 64
Total from the State Treasury for the two years			\$7,499 64

The committee has given careful attention to an investigation of what will be needed for an efficient and economical promotion of the silk culture industry in California for the next two years, which, after having been approved by the Board, is submitted for the information of the Executive and Legislature of the State:

Deficiency for the current fiscal year..... \$750 00

ESTIMATES FOR NEXT FISCAL YEAR.

Rent for Filature and office	\$600 00
Steam power and water	180 00
Three new double reeling machines	600 00
Machine work, plumbing, carpentering, etc.	500 00
Superintendent of Filature	900 00
Secretary's salary	900 00
State and District Fair expenses	750 00
Public meetings in different parts of the State	250 00
Silkworm eggs, trees, and seed	1,000 00
Purchase of cocoons	1,000 00
Filature instruction and reeling	700 00
Ten premiums for the best cocoons raised in the State	250 00
Silk culture station, trees, waterworks, and care of same	900 00
Cocoonery for silk culture station and room for care of silkworm eggs	1,000 00
Scientific investigations and incidentals	470 00
Total	\$10,000 00

For the second fiscal year, 1886 and 1887, the estimate of expenses would not include new reeling machinery, nor the erection of a cocoonery. But the certain large increase of the cocoon product two years hence will fully offset if not exceed these deductions. The committee, therefore, recommend that, for the next two fiscal years the Legislature be requested to make appropriations of not less than \$10,000 for each year for the use of the State Board of Silk Culture, and in addition thereto an appropriation of \$750 to meet the requirements of the Board for the balance of the current fiscal year.

The Finance Committee has also made an inventory of property in the possession of the Board on the first day of November, 1884, and finds the assets to be as follows :

ASSETS OF THE BOARD.

Reeled silk, 26 pounds—estimated value.....	\$156 00
Silkworm eggs, 120 ounces.....	480 00
Spooled silk, 726 boxes.....	150 00
First grade cocoons, 63 pounds.....	78 75
Second grade cocoons, 24 pounds.....	18 00
Third grade cocoons, 20 pounds.....	10 00
Pierced cocoons, 27 pounds.....	13 50
Double cocoons, 6 pounds.....	3 00
Floss and refuse, 10 pounds.....	5 00
Filature furniture and fixtures.....	326 95
Office furniture and fixtures.....	313 00
Silk hose, 44 pairs.....	220 00
Sundry donations, and proceeds of sales of silk hose, etc., cash on hand.....	328 34
Total.....	<u>\$2,102 54</u>

R. J. TRUMBULL, Chairman.

W. B. EWER, Treasurer.

REPORT OF C. A. BUCKBEE, PRESIDENT OF THE BOARD.

To his Excellency GEORGE STONEMAN, Governor of the State of California:

SIR: In accordance with the Act of the Legislature, approved March 15, 1883, establishing a "State Board of Silk Culture," I have the honor, as President of said Board, to submit its first biennial report.

Having received their several commissions, and taking the oath of office, the Commissioners met in San Francisco May 10, 1883, and organized for the transaction of business. By-laws and rules of order were adopted, standing committees appointed, and officers elected. Stated monthly meetings have been held without intermission since that date; also occasional special meetings, all of which have been open to the public.

Ten public meetings have also been held for popular instruction in silk culture, by means of lectures, addresses, illustrations of the work of the Board, etc., as follows: Two meetings in San Francisco, two in Sacramento, and one in each of the following places: Berkeley (Harmon Seminary), Oakland (Tompkins' public school), Alameda, St. Helena, San José, Stockton, and Redwood City. Mrs. Gordon gave the address at Stockton. The President of the Board gave lectures at all the other meetings, and he was very efficiently aided by others, whose instructions helped to awaken deep interest, among whom Mrs. E. P. Keeney, Mrs. H. B. Williams, Messrs. A. F. Saufrignon, of San José, Edward Carlson and W. B. Ewer, of San Francisco, J. J. Rivers, of the University of California, and W. H. Jordan, of Oakland, deserve special mention. The immediate practical results of those meetings convince me that similar meetings should be held in as many towns as possible throughout the State, especially in the central and southern districts. Hundreds of persons, on account of the information thus imparted, have been led to take the first steps toward silk culture, by securing young trees, many thousands of which are now in such a state of forwardness that the number who expect to make their first experiment in producing silk cocoons, during the seasons of 1885 and 1886, is very greatly increased. While I am not prepared to report the exact number of such persons, I feel confident that the producers during the next two years will be twice as many as those of the past year; and if proper provision can now be made for reaching our agriculturists in more distant localities, through public meetings and popular instruction, the industry will speedily become established in thousands of homes, from San Diego to the northernmost limits of the State. An hour spent with the people face to face, in explaining and illustrating the work, and answering their questions, will accomplish more than months of correspondence.

The attempts of the Legislature, in 1862, 1864, and 1866, to foster silk culture, had some good results; but the aid was too limited—a proffer of bounties for trees and cocoons. The bounty for trees insured to the benefit of a few speculators, and the premiums for cocoons

had no regard to their quality. As no provision was made for aid in reeling silk, the industry was crippled at the point where it required relief. The experience of other countries, in which the industry is now worth hundreds of millions of dollars annually to the producers, has guided your Commissioners. Following the example of France, Austria, Japan, and other countries, we have, to the fullest extent of our limited means, laid the foundation of a system of instruction and encouragement, as already shows very cheering results.

To have confined our work to bounties for trees and cocoons would have been to court the failures of the past. It would have been a temporary encouragement to speculators, but no real benefit to the industry. At our very first meeting, therefore, the three most important departments of our work were provided for by the appointment of standing committees, and their duties were carefully prescribed. Through one committee provision is made for securing the very best mulberry trees, cuttings, and seed, and a wise distribution of the same among the people. Another committee is instructed to secure silkworm eggs, and in order to insure their purity before distribution they must subject them to careful scientific examination. The members of this committee include some of the best scientists and entomologists in California, two of whom are members of the State University, and another is a leading member of the medical faculty of our State.

Another committee was instructed to take special oversight of a filature and silk reeling school. All cocoons offered by producers are carefully graded, under the supervision of the Committee on Cocoons, and paid for at the highest market prices, after which they are delivered to the Filature and reeled; the silk produced is to be kept or sold, and accounted for by the Filature Committee. If, in the scope of our work, anything less had been attempted, we would not have been able to make the report we now do, showing a fair degree of progress in every detail essential to ultimate success. The reports of the Standing Committees on Eggs, Cocoons, and Trees, on the Filature, and the Health Committee, are full, and will enable you to form an estimate of the gratuitous labor performed by the committees, and its value to the State in the development of the beneficent industry committed to our supervision.

The exhaustive report of the Secretary testifies to the diligence of that officer, and the great value of silk culture to the world, amounting to four hundred million dollars a year, while the manufactured product may be estimated at two thousand millions a year, giving employment to hundreds of thousands of operatives, is an eloquent appeal to our State to continue to use every reasonable endeavor to secure its rightful proportion to the benefits of so great and growing an industry. The two reasons for continuing the work are: First, the superiority of California's soil and climate, which are now admitted to be equal to the best in any other part of the world, for silk culture; and secondly, the employment that the industry can give to tens of thousands of women and young persons, in all coming time.

A silk culture station, similar to those established in Europe, seems to be very desirable. Ten or fifteen acres are now available for that purpose. There have been offered three several plots of ground in different parts of the State for such a station. If the means can be supplied to plant the trees, erect a suitable cocoonery, and keep

the station under proper care, it will serve many valuable purposes; such as cultivating and testing the best varieties of food trees for the silkworm, breeding and increasing the value of the best varieties of silkworms, producing the best seed for trees and worms for distribution, studying diseases of silkworms, and making known their remedies. In addition to these advantages the station, during the rearing season, would become an important educational center, where persons wishing instruction may be taught in all the details of hatching and feeding the worms, cocoon production, and the preservation of silkworm eggs.

The work and wants of the Filature and silk reeling school are fully set forth in the able report of the committee. The ultimate success of silk culture makes it of the first importance that this institution should not be embarrassed. Its proper location would seem to be in San Francisco, where multitudes of young people, especially girls, needing some suitable employment, are now waiting to be instructed in the art of reeling; so that they may be able to do something for their own support in the near future.

In my first annual report submitted to your Excellency, it was stated that one great advantage in silk culture is its partial solution of the labor problem in California, where there are peculiar phases of the subject. It will certainly help to round out the year with a succession of industrial pursuits. Silk culture, in respect to time, comes earliest in the range of agricultural employments. As soon as the young leaf appears on the tree the work begins. In six weeks the work is done. A few days more will serve to dry and ship the cocoons to the Filature. Not until this is all done does the season arrive for gathering and marketing fruit. Then follows the canning season, and after this we reach the period for gathering our rich yield of grapes. But when this is all done we have now scarcely anything left for our girls and boys to do. The above employments ought all to engage their energies, each in its season. We should claim it as our birthright instead of allowing it to be done by the Chinese, who have no interest in our civilization and no love for our homes. When, however, we have raised our silk, gathered and canned our fruits, and harvested our grapes, there are no employments to engage our hands from November until the following May. It is just here that the silk industry, when once established, will furnish beautiful employment for thousands of our youth in town and country. The Filature can give employment all the year round. With such institutions established at Sacramento, Stockton, San José, Los Angeles, San Diego, and other places, as they must be, when our citizens produce a tenth part of what can easily be grown, there will be work for tens of thousands of our sons and daughters, from the beginning to the close of the year.

For your further information, I have the honor to submit the accompanying reports; and I desire also to refer you to the first annual report of the Board, a copy of which is herewith transmitted for your examination.

Very respectfully,

C. A. BUCKBEE,
President.

FIRST BIENNIAL REPORT OF THE SECRETARY.

MEETINGS OF THE BOARD.

In accordance with an Act of Legislature, approved March 15, 1883, his Excellency Governor George Stoneman appointed the California State Board of Silk Commissioners. Their names and addresses are given on page three.

The first session of the Board was held May 10, 1883, at 808 Turk Street, at which the long-term members were duly balloted for and declared. By-laws and Order of Business were adopted.

The Board then proceeded to the election of officers, with the following result: President, C. A. Buckbee; Vice-President, Professor E. W. Hilgard; Secretary, Mrs. E. P. Keeney; Treasurer, R. J. Trumbull.

The following resolutions were unanimously adopted:

Resolved, That the California State Board of Silk Culture will purchase and pay cash, at the highest market value, for all cocoons that may be offered, whether now on hand, or raised by silk producers in the State during the current year, for the use of the Filature.

Resolved, That a Filature, or reeling school, be established, and a Superintendent of the same be appointed as soon as may be necessary, in order that applicants may be instructed in the details of the business, the idea being to encourage the prosecution of the silk industry throughout the State.

Resolved, That the Executive Committee are authorized to engage rooms for the office, not to exceed \$20 per month, and to procure the necessary furniture for the same; also, to procure books and stationery.

A special meeting of the Board was held May twenty-second, for the consideration of silkworm diseases and other important subjects. Two thousand copies of Bulletin No. 1 were ordered printed.

The second meeting of the Board was held June first, at which it was determined that prizes to the amount of \$170 be awarded for the best cocoons raised in the State during the year.

Mrs. Flora M. Kimball was requested to institute measures in Southern California for the further promotion of silk culture. Subjects were selected for addresses at future meetings by W. B. Ewer, Mrs. T. H. Hittell, Dr. C. A. Buckbee, and Professor E. W. Hilgard. An order was made for the purchase of sixty dollars' worth of the best eggs to be obtained in Europe and Japan.

At the third meeting of the Board, July sixth, a number of visitors were present and took part in the discussions. Dr. C. A. Buckbee and W. B. Ewer, and others, were requested to visit Berkeley and St. Helena, to address the people, and give such instruction as would best promote the industry in those sections. Dr. H. H. Behr was also invited to deliver an address before the State Board on "Silk Producing Insects." Premiums for cocoons raised by children under seventeen years of age were offered to encourage "home industry."

The fourth session of the Board took place August third, at which the establishment of the Filature was inaugurated, to be conducted as a technical school for perfecting those who were interested in the mode of reeling. Paul Consonno was elected Superintendent, at a salary of \$75 per month.

Mrs. E. B. Barker read a valuable paper on "Mulberry Trees in this State," followed by the report of the Health Committee, and an address by Dr. C. A. Buckbee, both of which are printed in the first annual report.

At the meeting, September seventh, it was voted to make an exhibit at the State Fair, representing the silk industry, which resulted in a most satisfactory display. This exhibit was also renewed at the Stockton Fair, and at the Mechanics' Fair in this city, attracting the attention of thousands to the silk industry.

The Filature Committee reported satisfactory progress in reeling silk, and recommended that samples be placed on exhibition at the Berkeley University Museum and various other places.

Interesting reports were read by Mrs. T. H. Hittell, Mr. Paul Consonno, and others. Mr. Consonno called particular attention to the strength, grain, and elasticity of the fiber of California silk, and recommended that a training school be established at some central locality in the State, for the purpose of teaching the best methods of raising the silkworm and preventing disastrous mistakes, which are likely to occur from lack of knowledge on the subject at the commencement. Realizing the necessity of a thorough understanding for the achievement of the best results in silk culture, particularly in its incipency, the California Silk Culture Association has framed a memorial to Congress to establish four experimental stations, one of which shall be located in this State.

The sixth meeting occurred October fifth. A letter from Felix Gillet, of Nevada City, was read, which gave much valuable information in regard to the various kinds of mulberry trees, leaves, and other food for silkworms.

A letter was also read from Professor W. T. Welcker, State Superintendent of Public Schools, relative to introducing the silk industry into public schools of the State. This letter gave rise to an interesting discussion in favor of the proposition.

A letter was read from Messrs. Saufrignon & Van de Castelee, silk manufacturers of San José, urging the coöperation of the friends of the silk industry in promoting the interest of silk culture, by creating a demand for the silk goods manufactured in this State. California manufactured silks are entitled to take rank with other manufactures, owing to superiority of the silk fiber, purity of the dye, and greater durability of the fabric.

The Board decided that it could not purchase cocoons raised in other States; the State's funds could not be used for that purpose, and the capacity of the present Filature would be fully taxed to utilize the home product.

The propriety of obtaining sample cocoons from other States for comparison, was suggested by Professor Hilgard, with the view of demonstrating the probability of producing healthier as well as superior cocoons. This experiment, once successfully proven, would establish a market for the finer quality of eggs in France and Italy, where the supply is deficient.

Professor W. T. Welcker being present, the objects of the Board were more fully explained by short addresses from members, who stated in substance that the chief aim, and the one most to be desired by promoters of the silk industry, was to provide a suitable and remunerative employment for women and children. The Superintendent of Public Instruction was recommended to encourage the

planting of mulberry trees around school houses throughout the State, and to advise teachers to instruct their pupils, during recreation hours, at least, in raising silkworms.

The purchase of eight additional reels for the Filature was duly considered and deemed necessary, in order to handle the increase in the cocoon product the ensuing year.

FIRST ANNUAL MEETING.

The first annual meeting was held in the assembly hall of the Board, No. 40 California Street, November 2, 1883, at two o'clock P. M.

The annual reports of the officers of the Board and Commissioners, as well as numerous papers by earnest and zealous promoters of silk culture, were submitted, and were published in the first annual report.

The officers and committees for the ensuing year were duly elected.

THE EVENING SESSION

Took place in Dashaway Hall, where a very creditable display of the silk industry of California was made.

The President, in his annual address, discussed the history of the State Board of Silk Culture.

Mr. Edward Carlson followed in an address on silk manufacturing in California. The address was published in the first annual report.

Governor Stoneman made an encouraging address. His observations had convinced him that the Legislature acted wisely in making an appropriation to encourage silk culture, concluding with an account of his own experience in the business in the home of his youth.

Mrs. Governor Stoneman, on behalf of the Committee on Awards, read the report, which gave premiums to the amount of \$170, to the following named persons: Mrs. Louise Reinzi and R. W. Mantz, of San José, first prize of \$50; Mrs. C. E. Babb, of San José, second prize, \$40; Mrs. E. Stevens, of San José, third prize, \$30; Mrs. Wm. Gwynn, of Sacramento, fourth prize, \$20; Miss Sarah Heald, of Petaluma, fifth prize, \$10.

Children under seventeen years of age were awarded prizes as follows: Miss Lillie Cook, of San José, first prize, \$10; Miss Stella Machefert, of San José, second prize, \$5; Master Adolph Muller, of Nevada City, \$5—special prize offered by Messrs. Keane Brothers. Harry K. Potter, of Nevada City, fourth prize, \$3; Miss Sophie L. Smith, of Petaluma, fifth prize, \$2. The report of the Committee on Awards was published in the first annual report.

The eighth meeting took place December 7. A paper on the proper method of growing the mulberry, with illustrations, prepared by Mrs. T. H. Hittell, was read, and has since been printed and distributed to mulberry growers throughout the State.

The ninth meeting occurred January 4, 1884. It was voted to purchase, for distribution, more silkworm eggs, more mulberry trees—both choice varieties and common white—to send a box of the sewing silk manufactured by Carlson & Currier, to each contestant for prizes (at the last annual meeting), who did not succeed in winning a prize.

The Committee on Cocoons, Eggs, and Trees, reported receiving a

small lot of choice silkworm eggs from Italy, through Mr. P. Consonno; also, great activity in distributing cuttings.

The Filature Committee reported fine progress. Nine pupils being in daily attendance. It was voted to keep the Filature working through January and February, in order to do justice to the pupils. It was resolved, that the regular monthly meetings of the Board hereafter be held on the last Thursday of each month.

The tenth session was held January thirty-first. The Committee on Cocoons, Eggs, and Trees reported a greater demand for trees and cuttings than was anticipated, and asks if more should be purchased. Voted to purchase enough trees and cuttings to fill all demands, if possible. Several letters were received from Mrs. Lucas and others, of the Women's Silk Culture Association of Philadelphia, urging the Board to take space for an exhibit at the Strawbridge and Clothier National Silk Exhibition, to be held in Philadelphia, April twenty-first. A Committee from the California Silk Culture Association consented to take the matter in charge. The Secretary reported having forwarded to the Women's Silk Culture Association of Philadelphia cocoons of the following named contestants for prizes, one pound each: Mrs. H. C. Downing, of San Rafael; Mrs. L. H. Brotherton, San Luis Obispo; Mrs. S. A. Jenkins, of Oroville; and Mrs. Elizabeth Dodge, of San José. Mrs. L. Reinzi and R. W. Mantz, of San José, had previously forwarded their own.

The Filature Committee reported a class of school children, with their teachers, visiting the Filature, who showed intelligent appreciation of the work.

The eleventh monthly meeting was held February twenty-eighth. A letter from Paris, France, by Horace J. Smith, was read, giving valuable information on silk culture. Mr. Edward Serrell (inventor of the Serrell automatic reel) writes from France an earnest letter of warning against silkworm eggs from China, on account of the widespread silkworm disease in that country. Requests for lectures on silk culture were received from the Tompkins School, Oakland, and the Girls' Branch High School, Powell Street, San Francisco; arrangements were made for complying with the requests.

The Committee on Cocoons, Trees, and Eggs reported a large shipment of cocoons from Salt Lake; also reported great activity in receiving and distributing trees and cuttings.

The Filature Committee reported fine progress. A large class of Filature pupils were present and received prizes from the Superintendent, according to the merits of their work as reelers.

Prof. J. J. Rivers, Secretary of the Health Committee, read a paper giving the result of his investigations of the disease Pebrine, and afterwards addressed the meeting on "Silk Producing Insects."

A paper was read by Mrs. T. H. Hittell showing how, under certain conditions, the osage orange leaves can be used as food for silkworms.

At the twelfth regular session, March twenty-seventh, the Executive Committee reported that lectures had been given by Dr. Buckbee at the Girls' High School, on Powell Street, and illustrated by natural samples of silk products, from the eggs to the manufactured articles. Lectures at the Tompkins School, Oakland, had been given by Prof. J. J. Rivers, Dr. Buckbee, Hon. W. B. Ewer, and Hon. W. H. Jordon, illustrated by maps, drawings, and the natural products of silk culture. Committee further reported that a prominent gentleman of San

Francisco had placed at the disposal of the Board a lot of land, about fifteen acres, in Marin County; the land to remain in the control of the Board so long as it shall be devoted to silk culture purposes. The Secretary was instructed to write a letter of thanks to the generous donor. Specimens for the exhibit of California silk products at the National Silk Exhibition, in Philadelphia, April twenty-first, had been placed in the hands of the committee, and would be creditably exhibited in connection with Belding Brothers'. Messrs. Carlson & Currier would ship our silk products with theirs. The committee also recommended that the Superintendent, Mr. Consonno, be authorized to secure rooms and make arrangements to raise silkworms, and at the same time give instructions to as many as will become pupils, in San Rafael or elsewhere, *provided* he can carry all expenses for the same, *except* his salary, by subscriptions from the citizens in the vicinity of his location. Recommendation adopted, as Mr. Consonno was sure that the subscription could be readily obtained.

Committee on Cocoons, Eggs, and Trees reported a donation of several ounces of best variety of Italian silkworm eggs, which had been selected with the utmost care in Italy expressly for this Board. Thanks were voted for the generous gift. The committee also reported that cuttings had been distributed to thirty-eight counties of this State, and applications for more were numerous.

The thirteenth regular session was held on April twenty-fourth. Horace J. Smith's letter, giving a very full account of silk culture in Europe at the present time, was read. The Executive Committee announced that Messrs. Carlson & Currier had offered two premiums, to be awarded at the State Fair in Sacramento in September, twenty-five dollars each; first, for best display of silk products in all its varied stages, from the silkworm eggs to the manufactured article; second, for the best yield of silk, after reeling, from cocoons, no less than one fourth pound of cocoons from each contestant, and recommended that preparations be made by the Board for a full exhibit of silk products and *reeling* at said fair.

Committee on Cocoons, Eggs, and Trees, announced that the silkworm eggs, which were reported at the last meeting as received as donations from Italy, had all prematurely hatched, owing to the different degrees of temperature to which they had been exposed during transit. As many as possible had been distributed through the State to those who had mulberry leaves to feed them and could *come* for them (as we could not with safety send live worms by express). Still the larger part remained. Mr. Consonno made hasty arrangements, by transporting them to San Rafael, and had rented a small house, where he could give practical instructions in silk culture. Knowing the worms to be of very choice variety, the Board considered this the best that could be done under the circumstances to save them. They proved to be the finest ever brought to California; probably, ever brought to America.

The President was requested to read a letter written by the silk manufacturer, J. D. Cutter, of New York, to a prominent lady of California, and his reply thereto, after which it was voted to have them printed and a copy sent to every Senator and member of Congress at Washington.

An earnest invitation from the leading citizens of San José was read at this meeting for President Buckbee to deliver an address on "Silk Culture."

A fine sample of California manufactured silk was then exhibited, being the work of Messrs. Saufrignon and Van de Castele, of San José, and presented by Keane Brothers, of San Francisco.

At the fourteenth regular session of the Board, held May twenty-ninth, the Secretary reported correspondence from all parts of the State, and Eastern States, seeking information on silk culture.

The Filature Committee asked for instruction in regard to renting rooms where filature work could be done, and, if practicable, rooms for the office also.

A letter was read from Mr. Carter, of Oakland, who had taken a large number of silkworms to care for at the Tompkins school house. Mrs. Heath gave a description of this cocoonery, and Mrs. Johnstone, principal of that school, gave an account of the financial needs and expenses of the same.

It was voted that a committee of three, Dr. Buckbee, Mr. Ewer, and Dr. Gibbons, should visit Mr. Carter's cocoonery, with power to purchase \$100 worth of cocoons, if they thought best.

The President reported that he had complied with the request of the citizens of San José, to lecture there, and had found very much interest in that city on the subject.

The fifteenth regular meeting was held June twenty-sixth. A lengthy earnest letter from Mr. Edward Serrell, inventor of the Serrell automatic reel, was read, in which he gave his views on the attitude which silk manufacturers *should* take on the question of silk culture in the United States.

The Secretary was instructed to write to Messrs. Carlson & Currier, that the Board desired to have the reeled silk, which had been on exhibition at Philadelphia, made into ladies' black silk hose.

Dr. Wm. Gibbons, of Alameda, made a few remarks on silk culture in Alameda County; had visited several parties who were experimenting in the business, but generally found insufficient quantity of leaves for feeding the worms. He had himself resorted to osage orange leaves with bad results. As one of the committee, he had visited Mr. Carter, who was raising worms in the Tompkins school building. He found that he had procured his leaves from a distance by buying them and having them sent, which is equivalent to *hiring* the leaves picked. Both the California Silk Culture Association and the State Board have always warned producers *against such* expenses. Mr. Carter's experience verifies the warning. If he had had no extra expense for leaves, his profits would have been *very large* for a *new beginner*.

July fourteenth, an informal meeting was held, to decide whether the Board would take all the cocoons and eggs which Mr. Consonno had raised in San Rafael, together with such lumber and fixtures as were left, and pay the expenses incurred, or allow Mr. Consonno to pay all bills and keep the property. It was decided to recommend that the Board take the property, and pay the bills. Mr. Consonno emphatically declared himself responsible for the safe keeping of the eggs, and the superior quality of silk to be reeled from the cocoons. This action was subsequently confirmed by the Board.

At the sixteenth regular session of July thirty-first, the Chairman of Filature Committee reported that silk-reeling was begun for 1884, July twentieth, at No. 21 Montgomery Avenue, with two reelers—one the teaching reeler of last year, Mrs. Soldavini, the other, Miss Hermann, a pupil who was under instructions a few months last year.

Dr. Dobbins, of Calistoga, gave an account of an experiment in silk raising in his home. With no previous knowledge on the subject, they commenced with an ounce of eggs, and estimated that two per cent of these died from overcrowding, and that two and one half per cent came out of the cocoons after they were supposed to be stifled; still he had furnished at the Filature for reeling twenty-three pounds of first grade cocoons, and some second grade and pierced cocoons.

It is very seldom that we can record that the results will pay the expenses the first year—sometimes not even the second year—but, in this instance, the experiment more than paid all expenses.

The seventeenth regular meeting was held August twenty-eighth, at which the Filature Committee reported that Messrs. Carlson & Currier had gratuitously manufactured and delivered to the Board seven hundred and ninety-one boxes of No. A sewing silk (three spools in each box), and fifty-four pairs of ladies' black silk hose of finest quality. A vote of thanks was unanimously given to Messrs. Carlson & Currier for their valuable aid and friendly interest. A letter was read from the gentlemen of that firm, in which they stated that the spool silk was manufactured in their mill here in San Francisco and is of excellent quality—that the silk for the hose, after being exhibited at Philadelphia, was sent to Northampton, Massachusetts, to be manufactured by Belding Brothers, who pronounced the California reeled silk to be nearly, if not quite, equal to the "classical Italian raw."

September thirteenth, a special meeting was held to consult on matters connected with the exhibit which was being made at the State Fair and other matters. The President made a report of his visit, an account of the opening, and an estimate of what the expenses of the Board would be.

It was stated that a part of the reeling machinery had been removed from the Filature and sent to the State Fair. In view of this, and other reasons, a motion was made, not to be at the expense of resetting the machinery, when it should be returned from Sacramento, but suspend operations at the Filature for the present. In the discussion which followed, the Chairman of the Filature Committee suggested that an effort be made to establish silk-reeling in some of our charitable institutions, where it might be beneficial to the young inmates; that our hand reel might be utilized, and some one of the Filature pupils employed to give instructions. Pending the discussion, the motion was referred to the Filature Committee (who asked to have Commissioner Trumbull added), to make inquiries as to the feasibility of closing the Filature, and report at the next regular meeting.

The eighteenth regular session was held September twenty-fifth.

Committee on Cocoons, Eggs, and Trees was instructed to make preparations for distributing trees and cuttings during the coming season, allowing, if possible, one hundred cuttings and five trees to each applicant. This committee reported that only a limited quantity of cocoons had been received at the Filature during the last month.

The nineteenth regular session was held October thirtieth, at which the Secretary reported a large correspondence. The President laid before the Board correspondence with the Commissioner of Agriculture at Washington. Several members having expressed regret that the Filature had been closed, and the desirableness of continuing its operations, a motion on the subject was offered, during the discussion

of which it appeared that our appropriation was exhausted, and it was finally resolved that the Filature be reopened as soon as funds sufficient to meet the expenses of the same can be obtained, and Mr. Trumbull, Mrs. Williams, and Mrs. Hittell were appointed, to coöperate with a like committee, to be appointed by the California Silk Culture Association, to make the necessary efforts to secure the funds.

The President notified the Board that the annual meeting would occur Friday, November seventh, and that the standing committees should be ready with reports, covering all their work for the last two years.

THE ANNUAL MEETING.

The annual meeting of the Board was held November 7, 1884. Members present: Dr. C. A. Buckbee, President; Prof. E. W. Hilgard, Hon. W. B. Ewer, R. J. Trumbull, Mrs. E. B. Barker, Mrs. T. H. Hittell, and Mrs. H. B. Williams.

After rolleall, the minutes of the last regular meeting were read and approved.

The Finance Committee's report was read and approved, following which, prizes, amounting to \$25, were awarded to those who had displayed the best cocoons at the State Fair this Fall, the money being donated by Messrs. Carlson & Currier.

During the reading of the Secretary's report, the President asked that the reading be suspended, at the request of Commissioner Trumbull, in order to proceed with the election of officers, which resulted as they appear on the third page.

The standing committees were announced by the President, and will be found on page three.

The reports of the different committees were read, approved, and ordered printed.

In closing, the President thanked the Commissioners for their unselfish work, and for their diligence and efficiency; he congratulated the State on the large increase in silk culture and manufacture, which, he said, are destined to be among the leading industries of the State, both on account of the peculiar adaptability of the climate and the intelligent capacity of those engaged in the work.

After a few encouraging words from visitors, the meeting adjourned.

MRS. S. A. RAYMOND,
Secretary.

REPORT OF THE COMMITTEE ON TREES, SLIPS, AND COCOONS.

We make the following extracts from the monthly reports of the work that has been accomplished by your committee, and also add a few incidents connected with their duties:

Received at the Filature, since February last, 1884, seven hundred and fifty-three pounds of cocoons. A large proportion were of a superior quality, while others were quite inferior. Most of the failures in the production of cocoons are caused by those engaged in the work commencing before they have the proper food for the worms, both in quality and quantity; particularly the latter. Wherever the worms have been properly fed and cared for, the result has proved satisfactory, the cocoons producing silk of the finest and most elastic fiber. The soil and climate of nearly every county in the State has been thoroughly tested and proved to be particularly adapted to the growth of the mulberry, also the silkworms; while success in prosecuting this industry can never be obtained without skill, proper care in feeding, and devotion to the work.

We find the interest in silk culture increasing annually. The demand for trees, slips, and eggs, during the years 1883 and 1884, exceeds that of previous years. Trees and slips have been distributed gratuitously in the different counties as follows: Santa Clara, Alameda, Lake, Sonoma, Sacramento, Napa, Humboldt, Placer, Yolo, Mendocino, Butte, Sutter, Santa Barbara, Shasta, Stanislaus, Amador, Merced, Contra Costa, San Luis Obispo, Santa Cruz, Colusa, Los Angeles, San Diego, El Dorado, Ventura, Fresno, Tulare, San Joaquin, Yuba, San Bernardino, Monterey, Inyo, Solano, Calaveras, Marin, and San Mateo. The distribution consisted of the following: sixteen thousand cuttings of white mulberry, and between six and seven hundred trees, some of them nearly eight feet in height, the price paid varying from \$10 to \$15 per hundred. The largest number was purchased from the nursery of R. J. Trumbull & Co., which were of fine growth, and bore successfully transplanting. We have distributed about forty-five ounces of silkworm eggs and fifty packages of seeds.

Liberal donations of white mulberry cuttings have been made to the Board from the following named persons: Dr. W. P. Gibbons, of Alameda, five thousand two hundred and fifty; Mrs. A. J. Donzell, two hundred and fifty; Mrs. William Snook, nine hundred and seventy-five; and Mrs. W. A. Stephenson, of Roseville, Placer County, four thousand five hundred. Through the Superintendent of the Filature, Mr. Paul Consonno, we have received a donation of eighteen ounces of best variety of Italian silkworm eggs. A portion of them were placed in his care, he being an experienced silk grower.

The cocoons produced were of fine quality; also the eggs, one hundred and twenty ounces of which we now have on hand for *sale* or *distribution* the coming season.

We have on hand one hundred and ninety-two pounds of cocoons, sixty-four pounds first grade, thirty-three second grade, and ninety-six third grade, including floss. During the year we shipped to the

Women's Silk Culture Association of Philadelphia, five hundred and forty-seven pounds of refuse cocoons, not being able to find a market here. Two hundred and forty-eight and a half pounds were on account of A. M. Meusser, of Salt Lake City; one hundred and thirty-six on account of A. Denari, of San Francisco; the balance on account of State Board of Silk Culture.

Amount received from the State Treasurer by the Chairman, and from other sources on cocoon account, is \$878 38; amount paid out for cocoons and incidental expenses, \$867 24; cash on hand to balance account, \$11 14.

The Chairman has written three hundred and thirty-five letters, one hundred and thirty-nine being letters of instruction how to raise mulberry cuttings, and two hundred and fifty-six postals; also distributed eighteen annual reports and seven hundred and ten bulletins.

Respectfully submitted.

MRS. E. B. BARKER,
Chairman of Cocoon Committee.

ANNUAL REPORT OF EXECUTIVE COMMITTEE.

The Executive Committee has held its regular monthly meetings during the year, and has attended to the duties pertaining to that committee. Reports from these meetings have been presented to the monthly meetings of the State Board, and have been satisfactorily discussed and disposed of.

The duties of our able and efficient Secretary have been prosecuted with intelligence and economy. They are laborious, and at times very perplexing, but we have always found her cheerfully and faithfully doing her work.

The President of the Board has attended our meetings, and has cheerfully afforded us advice and counsel when needed. The President has attended several meetings in different parts of the State, also the Normal Branch of the Girls' High School, in San Francisco, and some of the public schools in Oakland in the interest of silk culture, creating an interest by lectures, addresses, and illustrations presenting the practical workings of the industry.

In May last, at the request of the Mayor and leading citizens of San José, he held a meeting at that place, which was largely attended, and where great interest in the subject of the address was manifested.

We hope to be in a position the coming year to continue these meetings, particularly in the more remote counties of the State, which so far have been deprived of the advantages thus afforded.

Respectfully submitted.

MRS. E. B. BARKER,
Chairman of Executive Committee.

REPORT OF THE HEALTH COMMITTEE.

Dr. C. A. Buckbee, President State Board of Silk Culture:

SIR: The Health Committee has, as a rule, met monthly on the day of the regular Board meetings, and considered the various matters and communications referred to it. Among these was, in 1883, a case where most of a large brood of worms had done well up to their last stage, and then sickened and died rapidly. An investigation, with the aid of a microscope of high power, revealed the presence of the corpuscles of that dreaded disease known as

PEBRINE.

Pasteur and other investigators of silkworm diseases discovered that pebrine is always accompanied by the abundant presence of these minute bodies, and that it may be either hereditary, or generated, or communicated by contagion. Hence the corpuscles can be contained within the egg of the silkworm; the larvæ are then predisposed to the disease, which will afterwards be developed by any weakly or morbid condition of the insect. There then ensues a rapid multiplication of the corpuscles, which finally fill and engorge all portions of the body, causing the ultimate death of all sickly individuals or broods at some one of the stages of development. Diseased worms may even spin cocoons apparently healthy, but producing a similarly diseased progeny, if any.

While proper precautions will prevent the origination of the disease, it is none the less important to prevent the introduction of the hereditary tendency. With this view the Health Committee submitted, at the annual meeting of the Board, the following proposition, which was adopted, viz.:

"That the various consignments of silkworm eggs intended for distribution during the season of 1884 be examined by the ablest microscopists with a view to the detection of any sporadic germs of disease these eggs might contain, and that no eggs be distributed without first having the recommendation of the Health Committee."

The parcels of eggs from Japan and Italy, obtained in 1884, were investigated in accordance with the spirit and meaning of the above mentioned order; and the Health Committee hopes that, by strictly carrying it out, one great source of disease threatening the silk industry of the State will be nearly or quite done away with.

During the year 1884, no cases of actual disease have come before the Health Committee, and it is therefore presumable that no prominent cases of failure in rearing the worms from that cause have occurred in the State. It was not clearly established whether all these cases arose from the introduction of unhealthy eggs, or in part from improper treatment of the worms. It is most probable that both causes concurred toward the result, for the disease does not often assume so well developed a character in a single season.

The committee cannot but reiterate and emphasize their sense of the importance of impressing from the outset on all engaging in silk culture, the fundamental importance of taking all possible precautions against both the introduction and the origination of pebrine among the silkworms reared in the State. As regards the first point, it is covered so far as the operations under the auspices of this Board are concerned, by the resolution heretofore passed, requiring that all eggs shall before distribution be subjected to rigid examination as to their soundness by well qualified experts. This has been done with the eggs distributed during the past season, in which microscopic examination detected no trace of the corpuscles whose accumulation in the body of the worms is the prominent feature of the disease. It should be noted, however, that while the absence of the corpuscles from the eggs shows that the disease cannot have existed in any advanced stage in the parents, yet it does not exclude the chance of an inherited predisposition towards it, which will infallibly develop should the hatched brood be subjected to any of the influences favorable to the disease. It is therefore highly desirable that the examination of the grain by experts should be supplemented by the actual rearing of experimental broods, whose good or bad condition shall finally determine the question. This, of course, requires facilities not at present at the command of the Board; but should a silk culture experiment station be established, either by the State or by the United States, this would be one of its most important functions; the necessary food being in that case forced under glass, some time prior to the hatching season proper. It might even be in the power of many growers themselves to make these preliminary trials when they have a conservatory or greenhouse at command.

In order to insure attention to the needful precautions for the health of worms, the Health Committee recommend that each batch of eggs sent out should be accompanied by a printed slip giving instructions on the subject, embracing substantially the statements made in the committee's former report, viz.:

"Pebrine is induced and favored by any cause that lowers the health-tone of the worms, but especially by want of cleanliness, affording an opportunity for the introduction of their own effete matter into their food in the shape of dust, etc. This, in fact, seems to have been the original cause of the disease, which was then rapidly increased by contagion and inheritance. It is therefore of the utmost importance that the rearing cages or boxes be kept scrupulously clean, and that they be washed or otherwise disinfected from year to year; and the feeding of dusty leaves is always dangerous. Other predisposing causes are an insufficient supply of food; unsuitable food, such as stale leaves, wet leaves, the failure to maintain a regular temperature; excessive crowding of the worms, whereby they become liable to eat more or less of each other's offal, etc.

"While these precautions will prevent the origination of the disease, it is none the less important to prevent the introduction of the hereditary tendency, and the communication by contagion through the presence of diseased worms."

There is another cause which seems likely to lead to the rearing of weakly broods predisposed to disease and likely to produce a poor article of silk. It is the tendency, induced by the mildness of our

Winters, to a premature hatching of the eggs, whereby the worms, if not actually starved, are compelled to subsist for some weeks upon unsuitable, or at least unpalatable food, retarding their development and leading to the spinning of inferior cocoons. To prevent this often occurring trouble, there should be, at the command of this Board, a room specially designed with reference to ventilation and the maintenance of a proper and uniform temperature, where not only the eggs designed for distribution should be kept beyond the possibility of being injured by vermin, unsuitable temperatures, or untimely hatching, but in which any one so desiring should be permitted to store the eggs designed for the next season's broods, either gratuitously or at a nominal expense only.

The carrying out of this measure also could be best accomplished under the wing of a properly equipped experiment station; and this your committee consider as one of the first needs toward the healthy development of the silk industry in California.

E. W. HILGARD,
J. J. RIVERS,
MRS. T. H. HITTELL,
W. P. GIBBONS,
Committee.

REPORT OF MRS. JEANNE C. CARR.

CARMELITA, November 3, 1884.

Hon. C. A. Buckbee:

DEAR SIR: The exceptionally rainy Spring of this year defeated most of the plans for the extension of the silk culture in this section of the State. Several thousand cuttings ordered from me were left buried in the bundles until June, on account of the difficulty of communication and the preparation of the soil for planting. Some of the feed in older plantations was also injured by excess of moisture.

I have not had reports from those who made plantations in 1883, and send you specimens only of the cocoons made at Carmelita.

I have great faith in the ultimate development of the silk interest in Southern California. Letters are coming in from Elsenire and other new settlements, requesting information, with a view to planting mulberry trees this Winter. Also innumerable inquiries from eastern women, mostly from teachers, who wish to settle here and engage in the business.

We shall raise a large crop at Carmelita this year, which will be the fifth season in which a complete illustration of the processes of silk production, the varied steps in the education of the worm, etc., has been furnished here and enjoyed with apparent interest. So many specimens of cocoons of this year's crop have been given away to visitors, that the samples sent are hardly of average quality. The reports of the Board and printed matter relating to our work are eagerly sought for, and my supply has never been equal to the demand.

Respectfully yours,

JEANNE C. CARR,
Silk Culture Commissioner.

REPORT OF FLORA M. KIMBALL.

Dr. C. A. Buckbee, President State Board of Silk Culture:

My first effort as one of the Commissioners was to awaken an interest in San Diego County, in the subject of silk culture, by distributing silk literature, and writing letters on the industry to those whom I thought most likely to engage in the work. I am happy to report that my efforts were attended with a gratifying degree of success.

I notice that the Committee on Trees and Distribution, in the first annual report of the State Board, does not credit this county with any number of mulberry trees. While there are quite a number scattered here and there, planted merely for ornament, there is one grove of not less than three hundred trees, planted in 1869 with reference to raising silkworms. The project failed, however, but these trees furnished food last year for a few thousand worms.

Desiring to see the best varieties planted in the beginning of the enterprise, I applied, last March, to the Secretary of the California Silk Culture Association for mulberry cuttings. But the demand exceeded the supply, and she was able to send me only five hundred. These I distributed to ten parties in different portions of the county, all of whom report them making rapid growth.

I could have readily disposed of ten times the number of cuttings. With this small beginning very little can be done this year in raising worms, but if I can be furnished with another lot after the Winter rains set in, I will see that they are in the hands of those who are interested in establishing sericulture among other industries of this newly settled region.

I believe one great obstacle in the way of establishing silk culture in this State is the great desire to realize large and immediate returns from small investments. A powerful moral force is needed to bring the ambitious mind down to the small beginning that must be made to insure success.

I regret that the great distance from San Francisco precludes the possibility of attending the meetings of the Board, but the reports of your deliberations are read with interest, and give assurance of the ultimate success of the noble work in which you are engaged. May the brightest dreams of your most enthusiastic workers fall far short of the real consummation of your hopes, is the earnest wish of—

FLORA M. KIMBALL,
Silk Culture Commissioner

NATIONAL CITY, San Diego County, Cal.

• REPORT OF THE FILATURE COMMITTEE.

The Committee on Filature submits, with great satisfaction, this, its biennial report. It has much reason for thankfulness, in view of the good work it has already been able to accomplish, and the brilliant prospect it has of finally and fully accomplishing all the objects that it ever contemplated.

TESTIMONY OF PROFESSOR CHARLES V. RILEY, UNITED STATES GOVERNMENT ENTOMOLOGIST AT WASHINGTON.

In 1879 Professor Charles V. Riley stated, in his agricultural report of that year, as follows:

There has been no home market for cocoons in America. * * * As a means of meeting the difficulty, I have urged and would urge that Congress give to this department the means to purchase, erect, and furnish with skilled hands, on the department grounds, a small Filature or reeling establishment. In such an establishment reelers could be trained; and the cocoons, at first raised from eggs distributed by the department, could be skillfully reeled and the silk be disposed of to our manufacturers. A market would thus be formed for the cocoons raised in different parts of the country, *and a guarantee be given to those who choose to embark in silk culture.* * * * All industries should be encouraged in their infancy; and for the first years, or until the silk industry could be considered well established, the cocoons should be paid for at the European market rate, plus the cost of reeling.

CALIFORNIA'S LEGISLATURE HAS ACTED WISELY.

We Californians have reason to feel proud that what others have thus hoped for, our State has been the first to achieve. Through a wise munificence on the part of our Legislature, we have been able to establish a Filature to reel and spin the thread from the cocoons raised by the industrious daughters of California.

OBJECTS OF THE FILATURE.

The objects of the Filature are the teaching of silk reeling, the utilization of cocoons grown in California, the encouragement of the industry by the purchase and reeling of such cocoons, and the furnishing by means of it, of a market for the labor of women and children, and generally the fostering of silk culture in all its branches.

RESULT.

The result has been to demonstrate the productiveness of women and children's labor in silk culture. Another all-important object was to test the capacity of the young women of our State to learn and improve the method of silk reeling in such a manner that it might furnish remunerative employment for a large and deserving class of our population.

INSTRUCTION GIVEN.

To instruct effectually the committee procured the services of the most competent instructors, schooled in Europe for Filature work in the long tested and approved methods of the European Filatures.

IMPORTANCE OF FILATURE SILK.

The silk produced in China is mostly country or home-made silk. To prepare it for sale to American manufacturers, the raw silk has to be reeled, and no little effort was required to impress upon the Chinese the necessity of re-reeling it to suit our market. The reels for this purpose were, in the first instance, made in the United States and sent to China. Their use was brought about by the urgent and repeated representations of American silk merchants there. The re-reeling is, however, not always well done. Aside from carelessness, which alone would deteriorate the value of it very largely, there is considerable imposition practiced in *adulterating Chinese raw silk*.

ADULTERATION OF SILK.

Sugar, salt, rice, and acetate of lead, are mentioned as among the substances used for adulteration. Importations from China are increasing every year, but the silk has not improved in quality, being adulterated at least as much as hitherto. The Japanese have taken the following course: Within four or five years they have established a number of Filatures, where excellent work is performed. The Government has encouraged the work, and owns one of the Filatures, where skilled operatives from Europe were employed at first, and native labor has since been educated.*

ITALIAN LABOR IN CHINA.

In an article of November 18, 1883, of *Il Progresso Italia-Americano*, it is stated that four directors of Filatures from Lombardy have gone to the interior of Shanghai to direct the reeling of silk designed to be forwarded to European houses. They have taken with them several women who are proficient in this art to assist them in their duties of instructing the Chinese in the use of the modern Filatures. China has no desire to remain behind Japan in the perfection of her silk prepared for export to European markets, and in this particular evinces a public spirit that is highly commendable to our own National Government and the sovereign States of the American Republic.

These directors receive the munificent sum of £6,000 sterling for an outfit to establish a Filature, and £4,000 sterling as a direct compensation for their services, which *Il Progresso* very quaintly remarks "is not bad."

SUPERIORITY OF AMERICANS AS QUICK WORKERS.

Experiments show that we can produce better silk in America on account of the *higher mental condition of our people*, which shows itself in the ingenuity and inventive spirit ever improving on the worn out crude methods of the Asiatic race, in the perfection of machinery lessening manual labor, in the aid furnished by scientific researches, and in the quickness and skill of the workmen.

In an official report made at a large meeting held in reference to

* Extracted from a report of W. C. Wyckhoff, Secretary of Silk Association of America.

the manual labor question in Switzerland, the fact was mentioned that one seldom sees in Europe such skillful and quick working-women as in America, and curiosity was expressed that the American Government does so little for the education, in more diverse branches of manufacture, of laborers naturally capable.

SHALL WOMEN ENRICH OUR COUNTRY?

But one or two generations ago the farmers', laborers', and mechanics' wives and daughters, and the high born ladies with their maids, found plenty of productive employment in spinning and weaving, cutting and making, the linen and woollen clothes for the family. This has entirely ceased—but the number of women have increased who might be able to add much to the enrichment of our country. Much might be said of the evils and dangers which are likely within a short time to arise, from the fact that perhaps a large majority of American women find themselves, because of the present organization of society and industry, almost unable to contribute to the family income. Nay! They are scarcely able to support themselves.

WE NEED TECHNICAL TRAINING SCHOOLS.

We have made at least an attempt when we established a Technical Silk Training School, which was one of the things we have urged ever since the first establishment of the Silk Culture Association, in order to foster home industry.

We should earnestly consider the following argument:

Can American manufactures successfully meet in competition foreign products embodying a high degree of skill and taste? This is the important question of the day. If it is to be done, it must not be done by cheapening labor. There would be poor success in that. Nor must it be done by high tariff restriction, for, strictly speaking, this is no better than cheapening labor. It simply increases the cost of articles. If it is to be done at all, it *must be done by educating labor*; by the organization of technical and industrial schools and school gardens, where taste and skill may be cultivated and as good or even better workmen produced among us than in other countries. There is no good reason why we should not produce raw silk and more of it, make as fine silken goods as England and France, and thrive. An intelligent advocate of technical and industrial education says: "Americans should carefully study what European Governments have done and are doing for the better education of labor. The great branch of technical and artistic education has, of late years, undergone a surprising development in Europe, and is now exciting the greatest interest among all thoughtful men of America."

The United States is the greatest consumer of silk in the whole world. It consumes \$120,000,000 annually. The silk industry can never be secured on a firm and lasting basis until we can and do produce the raw material, independent of the supply of other nations. There can be little or no question that this can be done, and profitably done. No country can produce a better article, or more of it. Its production will induce new and improved manufactures, and attract and educate more and more skillful workers. And what is of most importance, thousands of now destitute women and children, for lack of work, will be furnished with work. That an ounce of prevention is better than a pound of cure, is a common saying. We spend every year hundreds of thousands of dollars for the support of paupers, lunatics, destitute and forsaken children, whereas a preventive might be found in manual labor training institutions.*

RAW SILK IMPORTED FOR OUR MANUFACTORIES.

There are three hundred and five large silk mills in the United States. We import four million two hundred thousand pounds of raw silk, three million pounds of reeled silk, one million pounds of spun silk. We deem it our duty to bring these statistics to the notice of our people for their attention and earnest consideration.

* The School Garden, by Mrs. Horace Mann.

CALIFORNIA'S ADVANTAGES FOR SILK CULTURE.

Our climate is admitted to be the best in the world for raising silk. We have an area of suitable land not to be surpassed in any country on the globe. Worms fed upon the leaves of the *morus alba*, raised on any of our elevated lands or foothills, will produce the finest, strongest, and the most valuable silk in the world. California has an area of about one hundred million acres of land. Two provinces of Northern Italy—that is to say, Piedmont and Lombardy, to which Italian silk culture may be said to be chiefly confined—have an area of only about twenty-five million acres. Those two provinces, besides supplying the home market, furnish for annual exportation raw silk and cocoons to the value of about \$30,000,000. From these facts, instituting a comparison, it is easy to see at a glance the immense future of silk culture industry in our State, if properly assisted and fostered in its infancy. California can easily produce not only better silk but more of it than any other country; and there is no good reason to doubt that the time is not far distant when in value and importance, silk and silken fabrics will rank in California among its first productions.

SILK CULTURE IN PUBLIC INSTITUTIONS.

We would respectfully submit to the attention of the Board the practicability of utilizing the labor of the inmates of our benevolent and reformatory institutions by the introduction into them of silk culture, where the climate and circumstances are favorable. With this object in view we should aim to instruct the young ladies who attend our Filature in such a manner and for such a length of time as to fit them to become normal teachers in all branches of silk culture and silk reeling. In France and Hungary many of the benevolent and reformatory institutions have by the introduction of silk culture into them been made to a great extent self-supporting. For like institutions in our own country silk culture can in the same manner be made a lucrative endowment, lessen expenses, and at the same time utilize a large proportion of our population who now produce nothing.

GOVERNMENT AID IN HUNGARY.

A recent report by M. de Bezerey, Government Commissioner for cultivation of silk in Hungary, shows that this industry is making considerable progress in that country. In 1881 there were two thousand nine hundred and seventy-six producers, who obtained forty-one thousand five hundred and thirty-seven kilogrammes of cocoons in four hundred and twenty-six communes, and the produce was sold for 41,816 florins. The corresponding figures of 1880 are one thousand and fifty-nine producers, ten thousand one hundred and thirty-two kilogrammes, one hundred and nine communes, and 11,062 florins. The Commissioner sold in Italy the produce of 1881 for 62,000 florins, and the profit realized paid for the institution of a model school for silk cultivation without exceeding the credit voted by the Chamber. This school has received three primary teachers sent by the Minister of Public Education, and three sent by the Minister of Commerce; three more are maintained at private expense. These will

acquire knowledge to be afterwards utilized in their place of residence. Further, a professor in the model school of Graz has given public lectures in several villages on the rearing of silkworms, and more than eighty kilogrammes of cocoons for eggs have been distributed gratuitously to cultivators. *Lastly, twenty-eight thousand nine hundred and fifty-six mulberry trees have been planted at government expense.* The report recommends the establishment of spinning mills in the country and the planting of mulberry trees on land belonging to the communes and on government roads. The climate of certain regions of Hungary is highly favorable to the production of silk.

A SELF-SUSTAINING FILATURE.

Our experiment further demonstrates that if sufficient cocoons are produced to keep sixty reelers at work at present rates in a Filature, no more government aid will be required. There will be profit enough to justify private enterprise in taking hold of the business of buying cocoons and reeling silk.

SAN FRANCISCO WATER A GREAT HELP TO REELERS.

We further take pleasure in stating that the water of San Francisco is better adapted for the purpose of silk reeling than that of most places where reeling is done, on account of its peculiar softness, and the absence of alkaline substances. This is of importance, for the reason that while in Italy and France silk reelers suffer much from sore fingers, produced by alkaline contained in the water, and substances have to be added to soften it, nothing of the kind is required in the greater part of California.

CALIFORNIA FAVORABLE TO BEGINNERS.

Experienced silk growers assure us that neither in Europe nor in Asia have the silkworms shown such strength and vitality to withstand carelessness in feeding and handling, occasioned by the ignorance of those who have for the first time raised cocoons, as in California. Notwithstanding bad treatment, they have survived and spun good cocoons.

NO TARIFF WILL BE NEEDED.

We deem it proper further to state that we are convinced that, on account of the superiority of our silk in fineness, gloss, toughness, and elasticity of fiber, it will be preferred in the market, and will be able to command the highest price. If enough is produced, it will clear the market of all inferior silk, and we are satisfied that a tariff will never be needed to exclude foreign articles.

EXPERIMENTAL SILK CULTURE STATION.

The idea of silk culture stations is not a new one. They have been tried in Europe, and found to be of the greatest benefit. They were started after millions upon millions of dollars had been lost by diseases of the silkworm, caused partly by improper food and partly by improper treatment, and by the distribution of the eggs of such worms, which, of course, could not be healthy.

It has been reported, and the report has been but too often repeated, that no silkworm diseases ever existed in America. It is possible that the report originated with persons employed in exporting eggs to Europe; but, however this may be, it is certain that the reports are not true. Diseases, and serious diseases, do exist; and worms are just as liable to be affected, if proper care and precaution be not employed, in America as elsewhere. We may flatter ourselves that California is one of the healthiest countries in the world for the silkworm; and it undoubtedly is, but at the same time it is not exempt from diseases. It would be strange, indeed, if it were. It is, perhaps, the healthiest for wine, but, nevertheless, there are losses by phylloxera; and so of other products.

It is necessary, therefore, and the necessity must be obvious, to go to work in an intelligent and business-like way.

The silk culture station should serve, not only as a model for educational purposes, but also as a bureau, so to speak, for the production and distribution of the healthiest and best varieties of eggs. It should be under the general superintendence of the Department of Agriculture at Washington; but it should be directed by a thoroughly educated professor of entomology and botany, assisted by a practical silkworm raiser, either Italian or French, schooled in Europe, and both should reside at the station.

Silk manufacture in this land can never be established on a firm and lasting basis until the raw material is produced in it; and to produce the raw material will require a very long time, unless the proper system be adopted. Whatever prejudices may exist in some quarters about "scientific farming," every intelligent person knows that to science is owing all improvement. Agriculture throughout the United States, often struggling for a long time against "scientific farming," was at length forced to adopt it. Silk culture desires to start with science, and to take advantage of everything that science can teach it.

THE MANIFOLD INDUSTRIES FOSTERED BY SILK CULTURE.

The production of cocoons will give employment in the way of reeling, doubling, twisting, cleaning, dying, making sewing silk, cord, braid, chenille, fringes, knitted hosiery, silk felts, weaving silks and ribbons, brocades, velvets, and gauzes. No other industry can be made so generally and universally a never ceasing source of supplying profitable employment, never ending in worth, never diminishing in demand.

MORE INDUSTRIES NEEDED.

Daily the want of industrial employment for our people is more and more felt. In Summer, harvesting our large wheat fields, in Autumn, fruit picking and canning, furnish employment to a vast multitude of people, but in Winter, thousands flock to the cities begging for work, and their cry, "give us work," is not heeded. Humanity, political economy, and the welfare and safety of our country, demand that we should pay more attention to the development of industries which provide suitable labor for those who are able and willing to work. Hundreds of noble workers, young men and young women, go to ruin in Winter for lack of work.

Thousands of sewing girls in New York and throughout the East-

ern and Western States, are forced to make shirts at fifty cents to one dollar and twenty-five cents per dozen. It has been testified in Court that a woman in Jersey City made coarse hickory shirts at twenty-two cents per dozen, delivering them in New York, and paying for ferriage each way.

The foregoing statements, among many other facts noticed by keen observers, show that we are speedily drifting to the same gulf out of which Europe is now in vain trying to extricate itself by finding a remedy for the neglect of former years.

SILK CULTURE BETTER THAN ALMSHOUSES.

It should be well understood that every dollar the State expends to train its children in technical, agricultural, and sericultural schools, will be worth more to society and the commonwealth than thousands and tens of thousands given to almshouses, prisons, and penitentiaries. Many eastern newspapers inform us that we have taken hold of the great modern lever that is to move the world; that is to say—the principle of making every one produce something of value. We should try to awaken the attention of our many wealthy citizens to this proposition, and interest their philanthropy in this practical direction. There can be no doubt that the future security and welfare of the State depend upon the preparation of the children of the State for useful and industrious pursuits.

A FILATURE.

A Filature is a reeling establishment where a number of persons reel silk on reels driven by steam power under the direction of a superintendent, who, with a vigilant eye, watches the operations of the reelers in order that they may produce that great uniformity in the thread which makes the silk first class, or classical, and this silk is of the highest value in the market.

“The great object in reeling is to get the threads uniform, rounded, well joined, properly freed from moisture, and so crossed on the reel that they will not stick or glaze, as it is termed. These objects are attained by twisting, and the to-and-fro lateral movement of the reel, as also by properly regulating the distance between reel and basin. The uniformity of the thread depends on the skill of the operator, who must supply a new thread as soon as one begins to give out. This is called nourishing the silk, and is done by dexterously casting, with the thumb, the new thread upon the combined strand, to which it immediately adheres. In this the reeler must use much judgment, for the silk of a cocoon gradually gets lighter and finer as it approaches the end.

“Whenever the silk rises in locks the temperature of the water is known to be too hot, and when it unwinds with difficulty the temperature is, on the contrary, too low. The operator is supplied with a skimmer with which to remove all chrysalides and refuse silk; also, with a basin of cold water in which to cool her fingers which are being constantly dipped in the hot basin.

“The thread of silk as it unwinds from the cocoon is valueless for manufacturing purposes, as only several of them combined make the staple of commerce.

"The persons employed in unwinding silk are mostly girls, one sitting before each basin, of which she has charge. The basin is made of copper, and the water is heated by steam at the control of the operator. The cocoons are plunged into the water when it is near boiling point and moved about so that the gum which fastens the threads becomes uniform and thoroughly softened. They are then beaten with a small broom having the tips split, so that the loose threads readily fasten to them. After beating a short time, the operator gets all the cocoons fastened, and taking the bundle of threads, shakes the cocoon till each hangs but by a single one; she now takes up five or six threads, according to the quantity of silk wanted, unites them, and introduces the combined staple or strand into a little glass eye on one side of the basin. She then forms a second similar strand and introduces it into a second eye on the other side. The strands are then brought together, twisted several times, separated above the twist, and introduced into two other glass eyes or ringlets, through which they are led one to each end of the reel or tambour, which is kept revolving in a steady, rapid manner, and to which is also given a certain back-and-forth side motion."

This embraces the whole operation done at Filatures, which produces the raw silk.

THE METHOD OF PREPARING THE RAW SILK FURTHER FOR MANUFACTURING PURPOSES.

To prepare the silk for the manufacturer it must undergo still further manipulations. The staple is first passed through a cleanser consisting of a clack lined with cloth, which catches any loose silk or other matter that may be adhering to it. It is then further cleansed by being passed through four similar cleansers (purgeurs), then twisted about five hundred times to the yard, then doubled and again twisted about four hundred times to the yard. It is finally run on to reels about one and a half feet in diameter, and taken off and twisted in a peculiar knot or hank. Through all these operations the oscillating to and fro lateral motion is kept up, so as to produce the diagonal crossing of the strands, and it will be readily understood that each staple is, in the end, composed of ten or more of the simple threads first spun by the worm.

SINGLES, TRAM, OR ORGANZINE.

A single is formed of one of the reeled threads, being twisted in order to give it strength and firmness.

Tram is formed of two or more threads, being twisted in order to give it strength and firmness. It is used for the filling or woof of goods. The word "tram" means simply filling.

Thrown silk is formed of two threads, or more singles, according to the substances required, being twisted together in a contrary direction to that in which the singles of which it is composed are twisted. This product is termed organzine. It is principally used in the warp that is to form the length of the goods. The art of throwing was originally confined to Italy, where it was kept a secret for a long period.

FLOSS.

Floss is made of the loose silk, carded and spun like cotton or wool. The loose or floss silk and the pierced cocoons, together with all that which from one cause or another cannot be reeled, is soaked in water for three days, boiled for one half hour in clear lye, washed in soft or in rain water, and when dry it is carded and spun and made into an inferior silk. We would recommend that an experiment be made here to utilize all second and third grade cocoons and the waste silk above mentioned, in order to study the real profit and the entire feasibility of silk culture. We should also utilize the chrysalides. After the silk is reeled from the cocoon the chrysalides, dried and ground, make a better manure than guano, and is used in Italy and China as the best fertilizer for gardens, and is considered more productive for the beautiful flowers China produces than anything else.

We would like to attract the attention to Mr. T. C. Tynah, of Paterson, N. J., who has patented an invention for spinning and reeling silk; and, also, to Mr. F. Seymour, of Paterson, the inventor of a machine which attracts considerable attention among silk manufacturers. The machine is intended to twist, double, and spin silk at the same time. It has two hundred and forty spindles, and occupies about the same space as a sixty-spindle doubling frame.

AUTOMATIC REEL.

We also must state that the new Serrill automatic reeler is to silk manufacturing what the cotton gin was to the cotton industry. It furnishes the missing link in the chain of industry, and solves the reeling problem, which has, heretofore, been the one obstacle to the development of silk culture in America, where hand labor, happily has never been offered at the degrading low prices of foreign countries.

The *United States Economist and Dry Goods Reporter* says, in an article of September 9, 1882, amongst others: "If Professor Riley can induce the Government to offer a premium of \$100,000 to any one living who will invent a thorough machine for reeling silk from cocoons, we will stand by him, much as our mind is steeled against subsidy jobs—for this would be a God-sent blessing to the country."

INSTRUCTION GIVEN AT THE FILATURE.

Eleven pupils were in attendance at the Filature, and several of them have made rapid progress. The silk which they reeled is uniform and well joined in the threads.

Besides instruction in reeling and medicating the water in the basins, the pupils received lessons in the fundamental principles of sericulture, and also some instruction in entomology, as far as pertains to the silkworm and all its metamorphoses.

These matters, in the opinion of the committee, are full of instruction, and are worthy of being taught in our public and other schools. To the children it will be of interest to study the metamorphoses of this wonderful creature—its development and its capacity for forming its cocoon, the unwinding and utilization of which gives employment to millions upon millions of people in making the most beautiful fabrics.

From our lengthy report of the Filature Committee of January, we state the following: "The committee submits to the consideration of the Board that those pupils who have advanced so far as to be entitled to the designation of skilled reelers need practice to make them quick reelers; for this purpose they need at least a year's practice."

It is important to ascertain more definitely by future experiment how much they will be able to reel per day, and how long a time it will take until they are able to reel a pound of silk per day. The Department of Agriculture's special report from Washington states that "an expert can reel in six days four and a half pounds of raw silk."

THE RESULT OF A LATER EXPERIMENT

Was, that after half a year's instruction, Miss Hermann, one of the pupils, reeled an average of six ounces per day.

During the month of January the Filature room was visited by several teachers of our public schools, with large classes of intelligent scholars. They were eager to learn something about silk and the method by which it enriches the coffers of the world with \$400,000,000 of useful wealth annually.

The mind of the young should at an early age be directed to observation. In the primitive world man roamed wild, one of the wildest of mammals; but being endowed with the sense of observation, he learned to use tools, and in time advanced to machines for providing food and clothing, spinning and weaving, as well as to the cultivation of ground and constructing dwellings. Through observation he may have learned from insects. He could observe them cultivating and harvesting, raising cattle, building towns and fortifications. But, though they keep slaves, no one is allowed to be idle. Amongst the ants and bees idleness is a mortal offense and punished with death. But what the insect was and what it knew hundreds of thousands of years ago, it is and remains to-day. Man, on the contrary, advances and improves. No one can foresee or foretell the possibilities of human progress. *With man's intelligence early awakened, properly guarded, and judiciously directed,* there seems almost no limit to what he may yet be able to accomplish.

A special meeting was appointed on Saturday, February twenty-third, for the pupils at the Filature to test their skill in reeling silk, and also for the purpose of entering as contestants for a prize offered for the first, second, third, and fourth best reelers of silk. The prizes were offered by Mr. Consonno, the Superintendent of the Filature, as an encouragement of skill, and also as a testimonial of good conduct, punctuality in attendance, obedience to instructions, and attention to work. Each pupil was required to reel four ounces of cocoons. Reeling was commenced at 10:30 A. M. and finished at 5:28 P. M. Miss Lucie Hermann commenced, 10:30 A. M.; finished, 12:07 P. M.; time for reeling, 1 hour 37 minutes. Miss H. Bernhoff commenced at 10:30; finished at 12:32 P. M.; time, 2 hours 2 minutes. Miss C. Reel commenced at 1:20 P. M.; finished at 3:07 P. M.; time, 1 hour 42 minutes. Miss F. Mental commenced at 3:15 P. M.; finished at 5:03 P. M.; time, 1 hour 42 minutes. Miss A. Celia commenced at 3:09 P. M.; finished at 5:28 P. M.; time, 2 hours 19 minutes. Miss Mary Corsen commenced at 1:30 P. M.; finished at 3:40 P. M.; time, 2 hours 10 minutes. The reeled silk was given to three experts to be examined—Mr. Brown, Mr. Hermann, and Mr. Consonno.

SILK CULTURE ONE OF THE FIRST INDUSTRIES FRANCE FOSTERS.

On March ninth, the stock of cocoons being exhausted, reeling was discontinued. The committee recommended that the Board should by all means possible, seek to dispel the ignorant notion, still to a great extent prevailing amongst many of the people, that silk culture is fit only for a barbaric nation. The plain facts prove the contrary. France, which is certainly one of the most cultured and progressive of the nations of Europe and the world, is one of the largest silk producers. If silk culture was fit only for a barbaric nation, how could it be that it should be one of the first industries France fosters? The statistics of the silk culture industry of France for the year 1883 foot up as follows:

Value of exports	\$65,017,841
Value of imports	50,350,861
Excess of value of exports over imports	\$14,667,031

Besides this, France produces annually more than four thousand millions of articles of luxury. As France has a territory smaller than Texas, it is well worth while to inquire what are the causes of its vast wealth. Its people are not excessively overworked. On the contrary, the French are the gayest people in the world. The main secret lies in the fact that its manufacturers have long been renowned for skill and taste. They deal not as we do, mainly in breadstuffs and raw materials, but in the products of the highest refinement and skill.

FILATURE REPORT OF JULY.

The Board decided by a majority to employ good reelers, in order to find out the degree and quality of the silk produced in California; and also in order to train, by further instructions and employment, one or two of the scholars who were being taught at the Filature to be able to superintend a reeling school, which we are convinced would be of great value.

To carry out these ideas a committee, consisting of Mr. Ewer, Mr. Buckbee, Mrs. Williams, and Mrs. Hittell, inspected and rented rooms with steam power for the Filature at No. 21 Montgomery Avenue.

In accordance with the decision of the Board, Mrs. Soldaveni and Miss Hermann were engaged as silk reelers.

Mrs. Soldaveni's terms were one dollar per day. Miss Hermann the pupil trained at the Filature, to receive fifty cents per day.

One of the objects aimed at was also to test the capacity of the pupils trained at our Filature.

The result shows that our pupils are able, after half a year's training, to reel at an average seven to eight ounces of silk per day. But we were not able to get a very expert reeler. The one chosen, although trained in Europe, has not been able to reel as much silk per day as expert reelers are reported to have done. The average per day by a skilled reeler is a pound of silk, while ours scarcely ever exceeded eleven or twelve ounces per day.

SILKWORMS SHOULD BE FED WELL.

We would like to urge that those who raise silkworms should pay stricter attention to the worms. They should be fed and cared for according to the rules.

We would also like to suggest that only first class cocoons for reeling should be bought and reeled. All second and third class cocoons should be carded and spun by machinery, which is cheaper and saves time.

The silkworm needs plenty of food, a warm and even temperature, ranging from seventy degrees. If the worm begins to spin on the twenty-eighth or thirtieth day, it was well fed and cared for, lacking neither food nor warmth of temperature.

Good, firm cocoons, spun by well fed worms, require but half the time in reeling which is necessary for cocoons produced by worms not well fed nor cared for. The silkworm is like a human being in this respect. It needs the most minute care and attention for its perfect development and usefulness.

REPORT.

The Committee on Filature had some improvements made in the iron steam reels, which were so changed that three different skeins of silk can be reeled at the same time on each reel, instead of only two, as before. The latest improved steam reels run four skeins at the same time, and are able to produce double the quantity of silk which we have been able to reel; but as the reeling at the Filature is mostly done by mere beginners, we cannot reasonably expect to produce more than half the amount we will be able to reel when our apprentices acquire a longer experience and practice. We further report that the firm of Messrs. Carlson & Currier have generously manufactured for us, free of charge, ten pounds of our raw silk into seven hundred and ninety-one boxes of No. A sewing silk, each spool containing a thread of one hundred and fifty yards in length. We are also indebted to that firm for manufacturing for us, free of charge, some of our raw silk into ladies' black hose.

NAMES OF THE PUPILS WHO HAVE ATTENDED THE FILATURE.

The names of the pupils who were daily in attendance at the Filature room, and the date of their entrance, are as follows:

September 1—Miss Henriette Burnhof.....	140 Green Street
October 1—Miss Jean Dodd	202 Stockton Street
October 9—Miss Adeline Celio	11 Hopton Terrace
October 23—Miss Henriette Hermann	821 Greenwich Street
October 23—Miss Lucie Hermann	821 Greenwich Street
October 22—Miss Natalina Isola	Mission Garden Ranch
November 6—Miss Frances Mentel	632 Broadway
November 6—Miss Carrie Reel	114 Valparaiso Street
December 1—Miss Mary Cortsen	4 Jackson Place, off Montgomery
December 17—Miss Gertie Jones	1834 Union Street
December 28—N. Peck	San Francisco
Silk reeled from August to December, 1883.....	18 pounds 8 ounces
Silk at the Filature.....	4 pounds 5 ounces
August 30—Silk delivered to Messrs. Carlson & Currier.....	2 pounds 8 ounces
September 29—For Mrs. Stoddard, of San Joaquin	2 pounds 13½ ounces
November 19—For Mr. Edward Wickson	0 pounds 2½ ounces
December 7—For Mrs. F. Fenton, of Santa Clara	0 pounds 3½ ounces
December 13—Pacific Railroad	0 pounds 5½ ounces
October 16, 17, 18, 19, and 20—Silk reeled for prize.....	1 pound 6¾ ounces
Total.....	30 pounds 3½ ounces

A TEST OF OUR RAW SILK FOR MANUFACTURE—CERTIFICATE.

Report of the California reeled raw silk, worked at Carlson & Currier's silk mill, in San Francisco, in September, 1883:

Weight of raw silk received.....	2 pounds	8 ounces
Weight when manufactured.....	2 pounds	5 ounces
Weight when boiled off and dyed.....	1 pound	12 ounces
Total shrinkage.....		12 ounces
Loss.....		30 per cent

F. W. BROWN, Superintendent.
CARLSON & CURRIER, Proprietors.

The above test gave us four hundred and eighty spools of No. A sewing silk, each spool containing fifty yards. The spools bear the trade mark of the California State coat of arms.

Further, thirty-eight pounds of classic raw silk were converted by the same firm into fifty-four pair of ladies' black hose, and seven hundred and ninety-one boxes of No. A sewing silk, each box containing three spools, or two thousand three hundred and seventy-three spools of silk.

Silk reeled for different persons and presented to different institutions—Mrs. West, Mrs. Stodard, the Emigration Society:

University of California—Dr. Gibbons, Alameda.....	8 pounds	1½ ounces
From January to March—reeled by pupils.....	15 pounds	
From July till September.....	22 pounds	12¾ ounces
For premium—reeled at Sacramento Fair.....		12¾ ounces
Reeled during the Fair at Sacramento.....	3 pounds	6¾ ounces
	41 pounds	15½ ounces
Add to above.....	30 pounds	3¾ ounces
	71 pounds	19½ ounces
Total.....	72 pounds	2¾ ounces
	46 pounds	1½ ounces
On hand at the office.....	26 pounds	1½ ounces

Visitors to the Filature, 690.

The Filature Committee has earnestly tried to do its duty. It has watched with solicitude the progress made. Working merely for the good of the cause, and WITHOUT PECUNIARY BENEFIT TO ITSELF, it has had to encounter many trials and struggles, but our committee has the satisfaction of knowing that real and valuable progress has been achieved. It is convinced that the silk industry in California, the raising of cocoons, the reeling and carding of silk, the making of tram, organzine, and sewing silk, the knitting of hose by machinery, the weaving of ribbons, and the manufacture of gauzes, velvets, silks, and brocades, are entirely practicable. It is convinced that the silk industry will furnish more work, and better work, for women and children, than any other industry yet started.

MRS. T. H. HITTELL,
Chairman of Filature Committee.
MRS. H. B. WILLIAMS.
MRS. GEORGE STONEMAN.

REPORT
OF THE
COMMISSIONERS OF FISHERIES.

FOR THE
STATE OF CALIFORNIA,

FOR THE
YEARS 1883-4.

COMMISSIONERS OF FISHERIES.

A. B. DIBBLE, Grass Valley, Secretary and Treasurer.

R. H. BUCKINGHAM, Sacramento, President.

J. D. REDDING, San Francisco.



SACRAMENTO:
STATE OFFICE JAMES J. AYERS, SUPT. STATE PRINTING.
1884.

REPORT.

To his Excellency GEORGE STONEMAN, Governor of California:

The Commissioners of Fisheries for the State of California, appointed under an Act of the Legislature, entitled "an Act to provide for the restoration and preservation of fish in the waters of the State," approved April 2, 1870, respectfully submit their eighth biennial report.

SALMON.

This most important of our inland water fish is in great demand, not only by all our citizens for table consumption, but also by the numerous canneries, some twenty-one in number, situated on the banks of the Sacramento, the bays, and in San Francisco, having increased their business in the last few years to large proportions. The average pack now is about 200,000 cases per annum. The boats employed in 1883, in taking salmon, were about 1,200, and are increasing in number. The average catch to each boat is about 1,500 fish, weighing about 21,600,000 pounds, per annum.

The increase of catch for the last three years caused a marked decrease in the supply for the year 1883, with a chance of a more marked decrease for the year 1884, the causes of which are many, viz.:

First—Illicit fishing done during the close season.

Second—Loss of salmon in the tules.

Third—The consumption by seals and sea-lions, which are very destructive to salmon and other fish. They follow the fish from the Golden Gate to Rio Vista.

Fourth—The different kinds of aquatic birds, which are very numerous, and very destructive to the young of all kinds of fish as they are descending from the spawning grounds to the ocean.

Fifth—Dams and other obstructions near their spawning grounds.

These are the principal difficulties over which the Commissioners have no control, except as to the first.

THE VIOLATORS OF THE LAW.

The Commissioners have exercised their power to abate the evil of illicit fishing, but owing to the limited means at their command, they have been unable to do all that was required to be done. There has been in that direction a great amount of work performed, in different parts of the State, the most of which was done on the lower Sacramento and San Joaquin Rivers, and the bays of Suisun, San Pablo, and San Francisco.

During the close season of 1883 the Commission placed a patrol upon the rivers and bays, which has had a very wholesome effect.

Mr. W. C. Jones, the Deputy Commissioner, had charge of the patrolmen employed, and did good service, as his annexed report shows.

The marked increase of salmon caught in the last few years is on account of the demand from the canneries. During the heavy run in former years, the fishermen did not work more than one third of the time. The canneries take the most of the catch from the first of April to the fifteenth of July, and from the first of September to the middle of October. The fishermen work most of the time, say eighteen hours of the twenty-four.

It is necessary for the Commission to plant as many young salmon as can be procured, at the headwaters of the Sacramento, in order to keep up the supply. Owing to the breaking of the waterwheel of the United States hatchery on the McCloud River, and to other causes, the supply of young fish was cut short in the year 1883 more than 3,000,000. It will be necessary for the California Commissioners to plant not less than 4,000,000 young fish each year, in order to meet the heavy drain continually going on.

The present Commission has used considerable exertion against the violators of the fish laws, but unless some stringent legislation is obtained, our streams and bays will soon be without a needful supply of salmon and other fish.

The large demands that came from the packing houses in the year 1883, caused an unusual amount of fish to be taken. During this season, which has been an unusually short one, the amount of fresh salmon, which has been packed, amounts to 451,957 Spring salmon, and 160,542 Fall salmon, aggregating 7,349,998 pounds. The amount of fresh Spring salmon sold in the markets was 115,004, and of Fall run 52,902, aggregating 2,235,684 pounds; total number of pounds sold and canned in the year 1883, 9,585,672 pounds. These statistics do not include 60,000 or more caught above Sacramento City. In order to meet this immense drain, it will be necessary to have at least one hatching house belonging to the State on the Little Sacramento, or the McCloud, or Pit Rivers.

From the fifteenth day of October, 1883, until the first day of January, 1884, the run of salmon was very good, and especially in the month of January, as there were more caught during that month of what is termed the Winter run, than in years past. The cause was probably on account of the stage of the river, which was extremely low for that season of the year. The Spring run was retarded in consequence of the low water, and no considerable amount of fish was caught until after the twentieth of March. The outlook for a heavy run early in the season was not promising, there being less fish observed outside the Bay of San Francisco than for a number of years preceding.

The decrease of salmon in the McCloud River, in 1883, was caused by the continual blasting on the line of the Northern Pacific Railroad, above Redding; this caused the fish to stop below the United States hatchery, at Bairds, only allowing very few fish to ascend to their spawning grounds. It was a cause that could not be avoided.

Mr. Livingstone Stone, the Deputy United States Fish Commissioner for this coast, did all in his power to catch as many fish as would fill his contract with the Commissioners of this State (4,000,000), but did not succeed by about 3,000,000. The Commissioners desire not less than 4,000,000 each year in order to keep up the supply and to increase the number. The demand is increasing every

year, and, unless the number of young fish can be increased, our run of salmon will be less every year. In the year 1883 there were caught not less than 300,000 more than the Commission planted. A considerable number of salmon spawn in different streams, quite a large proportion running into the Sacramento and San Joaquin Rivers; and, in fact, we feel assured that most of the Fall run of salmon never reach the McCloud, but deposit their ova upon the bars between Colusa and Red Bluff.

EIGHTEEN HUNDRED AND EIGHTY-FOUR.

The run of salmon during this year has been very late. The Spring run was very light up to and after the first of April. During the month of April the run started in with a small catch, and remained so until the first of May, when a small increase was noticed for about two weeks; then the run slacked, and by the middle of May the fish were very scarce, and continued scarce all through May, resulting in the smallest take in a number of years.

The June run, which in ordinary years has been the heaviest, resulted in a very small showing; a heavy decrease for the Spring run.

The causes for the scarcity of salmon for the year 1884 are several, viz.:

First—The loss of fish in the tules in the years 1881 and 1882.

Second—The using of small mesh nets from 1877 up to 1883, and the increase of seines at or near the spawning grounds. The increase of nets used in the bays leading to the river has also caused a great decrease. The river is at times apparently completely dammed by nets.

The pack of salmon on the Sacramento for the year 1884 will fall short fully one half from that of the year 1883, although more than ordinary exertions have been made by the fishermen to obtain them.

The Commissioners in their report of 1878-9 predicted a heavy run of fish in the Sacramento River for the years 1883 and 1884, but, for the various causes mentioned, their predictions have not been fulfilled.

The Fall run of salmon of 1884 has been the lightest that was ever known in the memory of the oldest fisherman. On the first and second days of September the run was not as heavy as it should have been during the same days in the month of October. There is no cause known to the Commission for the marked decrease in the Fall run this year, as the Fall fish have invariably taken care of themselves.

EASTERN SALMON.

These are a different species and are entirely unknown to the Pacific Coast. They inhabit the waters north of the forty-first degree of latitude, and are never seen south of that degree. They are caught in great numbers as high north as the coast of Norway.

The California, or Chinook, are taken in lower degrees of latitude than any other kind of salmon, and run down as low as thirty-seven degrees north, which we believe is as low as they are ever caught. This is occasioned by the temperature of the water, which in some seasons of the year reaches as high as eighty degrees Fahrenheit.

At the time when the fish are seeking their river spawning grounds they begin to fail in quality as food (although they are used by a great many), and large numbers are secured just before spawning, by fish-

ermen and others, on the upper waters of the rivers. Numbers of fishermen have been known to catch and sell salmon immediately after spawning and upon the spawning grounds, when the fish were wholly unfit for human food. This grievous evil, in our opinion, should be prohibited by very stringent laws.

TRUCKEE TROUT.

Of this species of fish, most are taken in the State of Nevada, on account of the various dams in that State, which are constructed in such form that it is impossible for trout to raise over them. Unless the State of Nevada does something towards dam abatement, the Truckee River trout will be a fish of the past in a very short time. Although the citizens of Nevada stoutly deny this fact, it appears strange that no trout are caught above the Nevada State line, when in former years they were abundant the whole length of the river from Pyramid Lake to Lake Tahoe.

Commissioner Dibble visited several of the dams in the State of Nevada, and in his report, before the meeting of the Board held on the fourteenth day of April, 1884, he stated that the statements of the mill owners on that portion of the river in California were correct, in that it was impossible for trout to ascend the Truckee above Foulkes' Dam, near Verdi, in the State of Nevada.

LAND-LOCKED SALMON.

The Commission received from Mr. Atkins, Deputy United States Fish Commissioner at Bucksport, State of Maine, 30,000 eggs of the Shadoc salmon. They were received on the seventeenth of March, 1884, in good condition, and were hatched with only a loss of seven and one half per cent. They were distributed in the lakes as follows:

Bigler.....	15,000
Donner.....	5,000
Webber.....	5,000

The plant of land-locked salmon by the former Commissioners has only been a partial success. Very few of the fish have been taken as yet, although a better showing is looked for. At present writing, the catch has been about the same as last season, no great amount having been captured.

PERCH.

In former years this fish was very plentiful, but has become very scarce in the last few years, owing to several causes, viz.:

First—We believe the greatest cause of disappearance is due to the reclamation of our tule lands by closing the sloughs, whereby ingress and egress is stopped, causing them to deposit their spawn in the rivers, and the spawn is lost by being covered with sediment.

Second—By a continual drain upon the supply by Chinese and other fishermen, who are ever on the alert to find their hiding places.

In our opinion a law should be passed to protect them from seine fishing for at least two years.

For some reason the run of perch has been better this year (1884) than for a number of years past, owing, probably, to the several

breaks in the levees between Knight's Landing and Cache Slough, on the Sacramento River, which has allowed the fish egress from the shoal lakes into the tules. Perch are taken in all the lower rivers and streams of the Sacramento and San Joaquin; also in Clear and Tulare Lakes. They do not appear to have decreased in those waters where reclamation has not been so extensive, as in those tule districts above mentioned, but appear to be as plentiful as formerly.

It is not the habit of the perch to ascend very high in any of the streams, but they confine themselves to the more sluggish portions of the waters of the State, lakes and ponds, which seem to be their favorite haunts.

CHUB.

This fish, a great favorite with the Indian and Mongolian races, has been scarce for the past few years, but are now becoming more plentiful, the probable cause of increase being the breaking of the levees in the overflowed districts, which gives the fish a chance to return to the river. The outlook for the year 1884 is good for a fine run, from the fact that in the month of March they were numerous in the river, and, as the run lasts generally two or three months, we may expect a large increase from last year; their habits being similar to the perch, the probabilities are that the same causes lead to the same effects.

PIKE.

With reference to the pike, we repeat the same statement made in regard to perch and chub. The pike is more plentiful at the present time than most of our strictly inland fish. They ascend the rivers higher than most of the other kinds and are thereby protected, as most of the fishermen do not follow them very far up the river. As they are not taken in quantities except by those who fish with fyke nets, they ascend the river as far as Red Bluff. They are said to be a great enemy to the young salmon. They are a good table fish for baking or boiling.

The pike run commences with the channel pike in the month of December, and with the bar or school pike in the month of March. They vary in size from one half pound for bar to twenty-four pounds for channel; there is a marked increase for this year.

These fish are known on the upper waters as whitefish, although they bear no resemblance to the eastern fish of that denomination.

DACE.

The dace, a native of our rivers and lakes, were never very plentiful, and are on the decrease. They are similar in shape, but are different in color from the pike, being of a yellowish brown on the back, and a dingy white on the sides and stomach. The dace are nearly extinct; from what cause, the Commissioners are unable to ascertain at present.

MULLET (OR HARD-HEAD).

The mullet or hard-head is one of the most common of our inland fish, and is used more by the Chinese than by any other class of people—their extreme cheapness being the great desideratum. They are taken in large numbers during the Fall and Winter months.

They inhabit the lakes and sloughs, and also the rivers, but, like some other species of fish mentioned, are getting scarce. In our opinion, they need no protection.

CARP.

The carp has been introduced into the State by the United States Commissioners. They have proven a great success. They do well in any of our lakes and ponds, natural or artificial, and are one of the most prolific of all of the inland-water fish. The condition of the water, whether clear or otherwise, so long as vegetation exists therein, is agreeable to the carp. They are truly vegetarian in regard to diet; living and thriving upon vegetable food. It is the opinion of the Commissioners that the carp are a fish that will come into general favor with the middle class of our citizens, as they can be raised very cheaply by artificial methods. They are well known in China, where they are raised almost entirely by artificial means.

The carp will never be a fish sought after by our Waltons, as they are a fish that seldom take the hook.

Opinions differ in regard to the quality of carp as a food fish; the flesh being of a rather coarse order. They are not so highly flavored as some other kinds of fish.

The carp are already being taken in the Sacramento River, and in some of the lakes bordering on it—not in any great numbers as yet, but enough have been caught to show that they thrive well in our waters. The Commissioners are well satisfied that, in a few years, there will be any quantity of them, as they increase rapidly.

STURGEON.

This is one of our best and cheapest food fishes, and is coming more in favor with all classes of our citizens, and, like most other kinds of food fish, is steadily on the decrease in numbers. This is due almost wholly to the mode of fishing resorted to by the Chinese.

The catch for the year 1883 fell short fully fifty per cent from the result of the catch the previous two or three years. Unless something is done in the way of legislation, the State will, in a few years, be without this kind of fish, one of the best of cheap food fish that inhabit our waters.

In the opinion of the Commissioners, a law should be enacted to protect sturgeon less than twenty-four inches in length. The small ones are not marketable fish, but are dried and sent to China by the Chinese fishermen, who are the only ones that follow that line of the business, they having monopolized the sturgeon trade.

There are two species of this fish that visit our waters; one called the green, and the other the white. They are both good food fish. There is a difference of opinion as to which kind is the best; the majority, however, favor the white.

CATFISH AND BULLHEADS (OR POUT).

These fish were introduced into our waters by the late Commissioners, and have thrived wonderfully. All of the lakes, ponds, and sloughs of the central portion of the State are well stocked with them. It has been stated by fishermen that they would destroy all the native

fish. It is our opinion that it was a timely act on the part of the former State Commissioners to plant them just when they did, as our native fish were giving out. They are caught from the mouth of the Sacramento River as far up as Tehama, a distance of about two hundred miles. They are a fish that need no protection. They are so prolific that it is a question if they can ever be exterminated.

Catfish proper are not so plentiful as the bullhead. It is a mistaken idea that all the fish that are called catfish are so in reality. There are two distinct species, however, bearing a near resemblance to each other; the catfish having a peculiar build and a swallow-tail, while the bullhead or pout has a square tail. The pout seems to take to the lakes, while the catfish prefer the river, and are seldom caught in the lakes. They are coming more into favor with our citizens every year. The prejudice that existed at the time of their introduction is fast dying out, and the majority of our people claim that they are a better food fish than the carp. Whether such be the fact is a matter of taste.

The idea that they would destroy our native fish is a fallacy, as, in the last two years, statistics tend to show that such is not the fact. In this statement the disciples of the famed Izaak Walton, we think, will bear us out.

There is also in our lakes and rivers a small native catfish, not very plentiful, and too insignificant to call for any extended notice, the fish being seldom over four inches in length.

WHITEFISH.

This is what might be termed a land-locked shad. The results accruing from the planting of this kind of fish in our waters are not fully known to the Commissioners. They are a fish that do not take the hook, and, as our laws protect the lakes in which they were deposited from all kinds of nets, we have no reliable data as to whether they are a success or not. There are native whitefish that are caught in Lakes Bigler and Donner, which have been taken for those planted by the former Commissioners, but they are different in form from the eastern, being longer and more slim in build, and not so full in the shoulders.

The native, or river whitefish, are taken in great numbers, and are called fresh water herring. They are to be found in all the streams in the State; are small in size, from one half to one pound each. They are in great favor with the Chinese.

There has been no showing of the eastern whitefish so far, although it is five years since they were planted. Up to August thirtieth not one has been taken, so far as the Commissioners have any knowledge.

SHAD.

Since the Commissioners first planted shad in our rivers they have done well, so much so that the whole Pacific Coast can now be said to be well stocked. They have been taken from Monterey Bay on the south, to British Columbia on the north. The shad have large breeding grounds in the waters of the center of the State; their increase has been marvelously great. We have no accurate means of knowing the amount of shad that can be taken in a single day. Enough is known, however, at the present time, to assure us that an unlimited supply can be had in the proper season.

Of all the migratory fish in our waters, the shad is one of the most prolific. Our tule lakes are splendid spawning grounds for them. During the year 1883 the law to protect shad was in force; fishermen who caught them generally returned them to the water, but enough were caught to assure the Commissioners that they had greatly increased in numbers and growth, some being seined that weighed nine and three quarter pounds.

It is the opinion of the Commissioners that California is the only State in the Union where shad can be taken and marketed the year round.

STRIPED BASS.

This most desirable fish is not a native of our waters. A few were planted by the former Commissioners in the Bay of San Francisco at Army Point. In the opinion of the Commissioners they will be a success, as they have been taken in the Bay of San Francisco weighing four pounds, and one taken in the Bay of Monterey in September, 1883, weighed nearly seventeen pounds. It will be some time before striped bass will be very plentiful, as the immense area in which they travel will have to be well stocked before any one place would have any considerable number for the fishermen to work upon. In October, 1883, one was caught in the Sacramento River weighing sixteen pounds. This and other catches are strong evidence that the striped bass will propagate in our waters. The Commissioners find that by reason of thus stocking our bays the whole Pacific Coast is benefited, as in the case with shad. Bass have been taken as far north as British Columbia.

March third, 1884, a striped bass, weighing four pounds, was for sale in a San Francisco market. March eleventh there was one offered for sale that weighed eighteen and one half pounds. It seems to us that most of the eastern fish assimilate themselves very readily to our waters.

SALT WATER FISH.

ROCK COD, OR GROUPE.

This fish abounds in great numbers all along the Pacific Coast. The markets of California are well supplied from the Bays of San Francisco, Monterey, Tomales, and from Punta Arenas and the Farallone Islands; they are caught with hook and line near the rocks and are always in good demand.

Their habits compare with the blackfish of the New England Coast. There are as many as five different varieties; the red is considered the most numerous of all. In the last ten or fifteen years the markets received the most of their supply of this fish from outside the Bay of San Francisco. The decrease in the bay is owing to the same conditions as have caused the decrease of the inland or fresh water fish. They are gradually lessening in number by the continual drain upon them, occasioned by the various devices which our cosmopolitan fishermen use in their capture.

The immense number of small fish of all kinds annually destroyed by the Chinese and other fishermen in the bay, compel the marketmen to look further abroad for their daily supply, as not more than one half of that supply is obtained in the vicinity of San Francisco.

In former years most of the supply was obtained in and around the bays; at present the bays of Monterey, Tomales, Point Reyes, and other points along the coast, north and south, come in for their share of the market supply. As the consumption increases about ten per cent per annum, increasing with the increase of our population, the outlook for years to come is not promising. The Commissioners know of no way to increase the supply of fish of the varieties that are strictly indigenous to our salt waters, as the greater number of species are migratory in their habits—only few kinds remaining the year round in our waters. The best varieties of salt water fish are flounders, soles, turbot, and tomcod, which are taken in good quantities in the inland bays, the greater portion in San Pablo Bay. Sea perch, or porgy, as they are termed in the New England States, are a fine pan fish. Ours, in appearance, are darker in color than the eastern. Herring are considered the most plentiful of all our food fish. They are caught in great numbers in the Winter months, and are always in great demand.

BAY FISH.

San Pedro and San Diego Bays furnish most of the crayfish that are used in the markets of the State. Shoalwater Bay furnishes all of the native oysters, and a large proportion of the clams that are used in the various markets of the State. It is a well known fact that at the present time a large percentage of the food fish that are used throughout the State come from outside bays and rivers; only a small per cent being caught within the Bay of San Francisco.

In the opinion of the Commissioners the catch of all kinds of fish will decrease to a considerable extent in the next five years, if the Chinese are allowed to fish with what is known as bag-nets, for the purpose, as claimed by them, of taking shrimp. The nets they use are so small in size of mesh that they catch and destroy the young of all kinds of food fish by the hundreds of tons annually.

Monterey supplies annually a large number of fish of all kinds to the markets of San Francisco and the State.

EELS, BLACK BASS, AND LOBSTERS.

Eels, placed in our waters by the former Commissioners, have not been a success. It is probable that the place where they were deposited, and where they have made their home, has not yet been discovered; at all events, none have been taken since they were planted. It seems to us that they ought to do well in our inland waters, as they are fond of the bottoms of ponds or streams where mud prevails, as is the case in our lakes and rivers.

Black bass, in our opinion, would do well in all of our large lakes, such as Bigler, Donner, Webber, Clear, and Tulare.

Lobsters may not do well in our latitude. They are not caught in any considerable numbers below forty-one degrees north on the Atlantic Coast. In the opinion of the Commissioners it would be useless to expend any considerable amount to renew the lobster experiment.

In some of the lakes near San Francisco, quite a number of black bass have been taken, and they seem to have done very well.

In this report, the Commissioners who have signed it deemed it proper, in the naming of the various species of fish, to avoid Latin

nomenclature, and to call them by the good old Saxon or provincial names by which they have been known to our fishermen and people.

NOTES BY THE COMMISSIONERS.

The fish interest is on the increase all along the line, from the Oregon Coast to the line of Mexico, every bay having its well established fisheries, which send the greater proportion of their catch to San Francisco, where they find a ready market.

Most of the salmon which are exhibited for sale in the months of November, December, and January, are taken up the coast at Point Arenas, Little River, Eel River, Bolinas, and Rogue River. The species consists of what is known as the coast or steel-head. There are a few of the salmon taken at other points that are indigenous to the waters of the Sacramento River.

We would also respectfully state that when the present Commissioners were appointed they were at a loss to know where to commence, as the head of the old Commission, Hon. B. B. Redding, died a few months before, and the only one left was the Hon. S. R. Throckmorton, who was at the time in very poor health; and he also died in a month or so after our appointment, leaving us without any one to confer with who had any knowledge of what was to be done or where to commence. We entered upon our duty as strangers to the business, and it may have cost more to carry on the needed work than it did our predecessors, but when taking into consideration the amount of work done by the present Commission, we confidently believe that the people of this State will approve of our action and endeavors to secure and advance its fish industry.

The present Commissioners have used earnest endeavors to protect the fish interest from the unlawful raids made by unprincipled fishermen during the close season, by employing and placing a patrol on the various bays and watercourses of this State, which action has resulted in great benefit. During the month of August, 1883, the Commission caused the arrest of thirty-six violators of the fish laws, chiefly Greeks and Italians; all were convicted and fined. During the months of September and October, 1883, forty-eight Chinese were arrested for violating the provisions of Section 636 of the Penal Code, by fishing with set-nets, and in nearly all cases convictions were obtained. The Legislature should pass a very stringent law prohibiting the use of set-nets, whether for catching of shrimp or fish; shrimp nets especially are more destructive to the young of all varieties of fish than any other nets used, from the fact that while the fishermen, who are fishing for the market, use nets that will catch nothing but marketable fish, on the other hand, those parties who catch shrimps have their nets made of so small sized mesh that it is impossible for the young of any kind to escape therefrom, thereby catching and destroying immense numbers. The only way to avoid the evil is to stop the catching of shrimp except by the use of proper seines. If the mode adopted by the Chinese is allowed to be continued, in a few years they will have the Bay of San Francisco entirely drained of all kinds of food fish. The number of small fish, shrimp, etc., so taken by the Chinese, and by illicit fishing, amounts to thousands of tons per year. The distribution of fish, in 1883, was not as large as in former years, on account of the fact that the United States Commissioners did not send to the State of California any kinds of fish that

they had been accustomed to furnish in former years. Our Commission has sent out from the Shelby hatchery and distributed, between the twenty-first of May, 1883, and the first of January, 1884, over 95,000 trout.

In December, 1883, there were placed 600,000 young salmon in the McCloud River by the United States Fish Commission, at the expense of \$600 to the State of California.

On April 13, 1884, the California Commissioners planted over 200 carp in the lakes of Yolo County, and on April 25 placed a number in China Slough, Sacramento County.

The present Commissioners of the State of California have been unable to place new varieties of fish in the waters of the State, from the fact, mainly, that the United States Commission has not been able to furnish the much desired and needed supply. The United States Commissioner, Hon. Spencer F. Baird, in making annual distribution of fish, up to the year 1883, favored California with its proportion. To him and to his associates the people of this State owe their thanks for the successful stocking of our watercourses and bays with shad, catfish, carp, black bass, striped bass, whitefish, etc.

We most earnestly hope that, in the coming years, we may be favored by the United States Fish Commission with a supply of the different varieties of eastern fish.

VIOLATIONS OF LAWS.

The fish laws have been violated to a great extent on the upper rivers, by unprincipled men, who have established fisheries from Fremont to Redding, on the Sacramento River. The great damage that has been done by these up-river fishermen has been occasioned by the continued drawing of seines upon the gravel bars, not only in the taking of the fish ready to deposit spawn, but also in destroying the ova already deposited upon the gravel bars, these bars being the natural spawning grounds of the salmon. In the opinion of the Commissioners, the State should set apart that section of the river from Jacinto to the McCloud and Pit Rivers as breeding grounds, so that no net or seine could be legally used in that portion of the river. If a law of that character is not passed and enforced, the salmon interest of this State will be of short duration, as the parties using seines on the spawning grounds do more towards annihilating the salmon than all the gill-net fishermen, as the gill nets are nearly of a uniform size of mesh, and only take matured fish, while the seines take all sizes, from one half pound up.

In the opinion of the Commission, it would be wise for the Legislature to enact such laws as will control excessive and prohibit destructive modes of fishing, such as Chinese bag nets, Chinese trout lines, etc., as they are destructive to the young of all kinds of fish.

The Commission would advise that a law be passed to prohibit the use of any weir, pound, bag net, China trout line, set nets, and all other contrivances, in the public waters of this State, with the exception of the fyke nets, and providing that the wings thereof do not extend more than twenty-five feet in the stream from the bank or shore; also, to enact such laws as will prohibit the Indians from taking any kind of fish by any other method than was in use by them prior to 1850.

SHELBY HATCHERY.

The hatching of trout at the Shelby hatchery was started in the month of May, 1883, and during the year there were hatched and distributed over 95,000 trout, and, although this hatchery was started very late in the season for trout hatching, it establishes the fact that the conditions and surroundings are very favorable to the business.

The hatching house was, in 1883, under the charge of Mr. Richardson, a gentleman well versed in the art of propagating fish artificially. Under his management, in the space of two months, over 95,000 were hatched of the species as follows: McCloud River, Lake Bigler, Donner Lake, and Modoc or rainbow trout. After the appointment of the majority of the present Commission they examined into and took charge of the property belonging to the State, which consisted of an old building called a hatchery, situated about one mile from the railroad in Alameda County, near Chabot Lake; some transporting cans, and a few hatching boxes which were not worth moving. As soon as we could conveniently get to work, the Commission found a suitable place for a temporary hatchery, which is situated on what is called Butterfly Creek, between Colfax and Grass Valley, on the Nevada Narrow Gauge Railroad. The Commission received the privilege of building a hatchery house, with the use of a bountiful supply of water, from the owner of the property, Joseph Shelby, Esq.

SACRAMENTO RIVER.

The Sacramento River, which heads in the northern part of the State, runs nearly north and south through four degrees of latitude, and is one of the best salmon streams in the world. At the head the water is clear and icy cold, and the river has a fine gravelly bottom, making fine spawning grounds.

The principal tributaries are the Pit River, which rises in Siskiyou County in Goose Lake, and the McCloud River, which is one of the finest streams in the State of California, and widely noted as a trout stream. Here the United States Commission built their hatchery. The water is very cold, more so than any other stream in the State.

The Feather River is another branch, and in early years was a very good salmon stream, but of late years the salmon have not ascended on account of the impure water.

M'CLOUD RIVER.

The United States hatchery on the McCloud River has been a great benefit to the State of California in years past, on account of the large number of salmon which have been planted and obtained from it in the headwaters of the Sacramento River. The abandonment of the hatchery and of the propagation of fish by the United States Commission, leaves the State of California without any hope of depositing any salmon fry in any of our streams this year (1884). It is to be hoped that our next Legislature will make an appropriation that will enable us to establish a hatchery, in the year 1885, on one of the branches of the Sacramento River. As our interest in the packing of salmon is very great, it occurs to us that the State should make liberal provision in the direction mentioned. The United States hatchery,

on the McCloud River, has been virtually given up, and we can expect no further salmon supply in that direction. Unless the Legislature make an ample appropriation for the erection of a State salmon hatchery, the decrease of salmon will annually continue, and in a short time we will neither have the salmon for a food, nor the canneries as an industry, and the fisherman vocation will pass away.

FISH-WAYS, OR LADDERS.

Not many arrests, up to the present time, have been made for the violation of the law by dam owners, in failing to establish ways and ladders.

The dams on the headwaters of the Stanislaus, Tuolumne, San Joaquin, and the upper Sacramento Rivers, are, in our opinion, a great drawback to the salmon interest, as the spawning grounds are, for the most part, above the dams. There being no fishways at the dams, the fish deposit their ova farther down the rivers, where fishermen are using nets, and thereby disturbing the ova and killing every egg that would otherwise mature. The failure to erect proper fish ladders was one of the causes of the decrease of salmon in the year 1884.

APPEAL TO THE LEGISLATURE.

The California Commission call upon the next Legislature to make appropriations for two hatcheries—one for the purpose of hatching trout and keeping the same in proper ponds until they become at least four months old, and a hatchery for the breeding of salmon on the headwaters of the Sacramento River. Without these hatcheries the Commission will be unable to keep up the supply. The demand now exceeds the supply by more than 100,000 matured salmon. The California Commissioners have been dependent upon the United States Commission for all salmon supplies, and we can no longer look for fish in that direction. Because the California salmon do not thrive well in Atlantic waters is the reason why the United States Commissioners have discontinued their work at the McCloud River hatchery.

AMERICAN RIVER.

This branch of the Sacramento River is nearly depleted of all kinds of fish, although most of the small streams which empty into it are well supplied with small brook trout. The same can be said of the Feather and Yuba Rivers. The great cause of depletion is owing to the fact that gold mining has been carried on upon those streams from the first discovery of gold to the present time, causing the water to be heavily charged with debris.

It is the opinion of the Commission that the accumulations of sand, etc., from the mines work great destruction to the ova by covering it with deposit, and also forcing the fish that would naturally breed in these waters to seek other streams where the water is purer.

SAN JOAQUIN RIVER.

This is a very good stream for the Fall run of salmon, the ascent being not very steep, and the current, especially the first seventy-five miles, not being very strong. The different branches form fine spawn-

ing grounds, provided the fish could reach their headwaters. The only stream emptying into the San Joaquin not dammed is the Mokelumne. The Tuolumne and Stanislaus are dammed in such a way as to prevent the fish from ascending.

BIG MEADOWS.

These meadows lie in Plumas County. They are grand spawning grounds for trout. The north fork of the Feather River runs through the meadows. The river derives its waters from springs, some of which are extensive, causing large streams to flow into the main river, and furnishes, with a large realm of water, one of the finest spawning grounds in the State—one of the best for feeding, spawning, and fish increase. The water is cold at all seasons of the year; the temperature not higher than sixty degrees Fahrenheit. The waters have been diverted from the original watercourse by what is known as the Watt cut, which, at certain times of the year, leaves insufficient water for fish to ascend over the natural falls in the river, causing great complaint from the property holders along the meadows. They have just cause for complaint.

THE M'CLOUD RIVER.

The McCloud River takes its water supply from the Shasta Buttes. The river runs nearly north and south, with little variation, through six or seven townships, and ranks among the finest of our mountain streams. The water is always cold, varying in depth from three to fifteen feet. It is also a most excellent trout stream, the rainbow and Dolly Varden trout being caught in its waters in great numbers, and weighing from one half pound to eight and ten pounds each.

Salmon also ascend the McCloud in great numbers for the purpose of spawning during the season. At this time of the year it is a known fact that they will readily take the hook, a fact not known to exist in any other river in our State.

The tributary of the Little Sacramento, called Dog Creek, is well stocked with trout that weigh from one half pound to three pounds.

Mosquito Creek is well stocked.

Little Mosquito and Portage Creeks are well stocked with California brook trout, and of average weight with those found in the small streams that empty into the Sacramento, Pit, and McCloud Rivers, making that section of our State one of the best trout fishing localities found in our own State or the United States, as also furnishing the best spawning grounds in the world considering the area.

The different branches of Pit River are as follows:

Hat Creek is well supplied with the rainbow trout, which average from one half pound to four pounds above the falls, and weighing from one half pound to eight pounds below the falls.

Hatchet Creek also abounds with small brook trout.

Bennie Creek, above the falls, is also well filled with large brook trout, pulling the scale at one and one half pounds.

Fall River is also well supplied with the black trout and native whitefish. The latter fish do not resemble the eastern whitefish. In fact all the streams that empty their waters into Pit and McCloud Rivers are all good trout streams and well stocked.

The streams on the eastern divide of the State are not so prolific with trout, although some few are well stocked. The lakes are well supplied. The only streams which appear to have become materially exhausted, are our coast streams in and around San Francisco. This, no doubt, is owing to the large population that indulge in the pastime of angling. There has been a scarcity of food for the trout to feed upon in the upper rivers, but the fish have done better during the last few months. This may have been caused by the continued blasting on the northern railroad in the vicinity of their feeding and spawning grounds.

In our opinion, the McCloud River trout are migratory, and are called on the lower rivers, salmon trout.

CLOSE SEASON.

On the first day of August, 1883, the Commission placed a patrol upon the Sacramento River and adjacent bays, under the direction of W. C. Jones, as Deputy Commissioner. The arrangements for the patrol were completed by the ninth of the month, when the first sortie was made and several parties were arrested for illicit fishing. From the ninth of August, the patrol was kept in the field. In fact, the pirates and violators of the law seemed to forget that there ever was a law passed for the protection of salmon. It was a hard matter to make them believe that the Commissioners were in earnest. Deputy Commissioner Jones at times was compelled to resort to force in order to prevent parties from further violating the laws. In the opinion of the State Commission, Mr. Jones has succeeded, by his energy and intrepidity, in stopping almost all of the lawless and wanton destruction of salmon, especially during the close season of 1883.

During the close season of 1884, viz.: the month of August, there was but little illicit fishing done, except in the last few days of the month, when a few boats ventured out, and those were captured by our deputy, W. C. Jones.

One of the greatest drawbacks to successful work is, the want of a proper conveyance to patrol the rivers, and at all times; sailboats are not always successful in making captures, on account of the fishermen having fast crafts of their own, and, as soon as the Commission's boat is discovered, they escape. This is owing to the fact that the most of their boats are superior sailers. The Commissioners need a good steam launch, with a light draft of water, having speed sufficient to overtake and bring the violators to justice.

REPORT OF DEPUTY FISH COMMISSIONER W. C. JONES.

We herewith submit the report of Deputy Fish Commissioner W. C. Jones:

BIRD'S LANDING, January 1, 1884.

To the honorable Board of Fish Commissioners of the State of California:

GENTLEMEN: In compliance with your request, I hereby submit my report from August 1, 1883, to January 1, 1884.

On the first of August, 1883, I received a deputy commission authorizing me to patrol the Sacramento River, the San Joaquin River, and Suisun Bay.

Up to the ninth of August I succeeded in locating several tanks and salt-houses, where active preparations were being made for the purpose of salting fish during the close season. Up to the ninth, no arrests had been made. On that day, in attempting to arrest two Greeks in Three-mile Slough, one of them, named A. Nicholas, was killed; the other, John Peterson, was arrested. Nothing more occurred until the fourteenth, when two nets were captured near Chinatown, the owners escaping. On the sixteenth, a raid was planned, using the steam tug Belshaw, owned by Captain Nelson & Co., of the Benicia cannery, and up to the twentieth, we captured thirteen hundred salted salmon and three tanks. In this raid, no owners appeared. On the twenty-first, five men were taken, and on the twenty-second four more, for violating the fish laws; on the twenty-seventh two more, and on the night of the thirtieth sixteen men, making a total for the month of August of twenty-nine individuals. During the month of September nothing of interest occurred.

By directions of your Board a raid was planned to overhaul the Chinese fishermen in San Pablo and San Francisco Bays, and during the ten days following, we captured forty-three Chinamen who were using set-nets. On the twenty-ninth two Greeks were captured near Collinsville, violating the Sunday law. November second, took in four Chinamen with nets set across Cache Slough, and on the eighth four more, for the same offense; making a total number of prisoners up to the eighth of November, inclusive, eighty-two. Of the white fishermen there were thirty-one. Their nationalities are as follows:

Greeks	14
Italians	10
Portuguese	4
Austrians	2
Germans	1

The whole number were convicted, thirteen paying fines of \$50 each; the remainder serving out their sentence in jail. Of the Chinamen, fifty-one in number, eighteen were convicted; fifteen were tried at Martinez by jury and released, and five more that were tried at San Rafael were freed by jury, ten convicted, and the remainder were not brought to trial. Nothing more occurred until January 15, 1884, when, by direction of your honorable Board, I descended the Sacramento River to inspect nets. Found two at Courtland, one at

Emmaton, one at Collinsville, below the legal size in length of mesh. The owners were all arrested. The one at Emmaton pleaded guilty and was fined \$50 on the twenty-ninth of January.

On the sixteenth of January found two nets below legal size at Courtland. One of the parties pleaded guilty, and on the eighth day of February was fined \$50.

COLLINSVILLE, October 20, 1884.

To the honorable the Board of Fish Commissioners :

GENTLEMEN: In compliance with your request, I hereby submit the following report from January 1 to October 23, 1884, inclusive. I have captured the following, viz.:

January 15 to 25—Fourteen Greeks and Italians, charged with stealing a house located on the lower end of Grizzly Island, on or near the north boundary of Suisun Bay. All of the above parties were tried in Fairfield, and found guilty of petty larceny, fined \$50 each and costs, aggregating \$80 to each prisoner.

February 10—Took in Harry Beyer, John Seevie; February 15—Frist Hartman, Frank Har-
mainsons, J. D. Crandell, Frank Robies. Discharged.

February 15—Antone Bruers, tried at Benicia, and fined \$50.

February 15—Alonzo Pisto, tried at Benicia, and fined \$50.

February 25—A. Devoto, tried at Benicia, and fined \$50.

February 25—A. Costo, tried at Benicia, and fined \$50.

February 25—Santo Lucee, tried at Benicia, and fined \$50.

February 25—Christ. Manuel. Sent to jail.

March 15—Peter Bumbus. Sent to jail.

March 15—George Manuel. Sent to jail.

March 12—Peter Dago. Sent to jail.

March 12—John Nacht. Sent to jail.

March 19—Costa Stratto. Sent to jail.

March 19—A. Thedros. Sent to jail.

April 17—Tom Lee. Sent to jail.

April 17—Ah Chung. Sent to jail.

April 17—Ah Gon. Sent to jail.

April 17—Ah Shone. Sent to jail.

April 19—Peter Tom. Fined \$50.

April 19—A. Constantine. Fined \$50.

May 5—George Brown. Fined \$50.

May 5—John Smith. Fined \$50.

May 5—Dometry Bobi. Fined \$50.

May 5—John Brown. Fined \$50.

May 5—Demetro Lawrence. Fined \$50.

May 5—Nicholas Bruces. Fined \$50.

May 5—John Mimecha. Fined \$50.

May 5—John Andrews. Fined \$50.

May 5—George Brown. Fined \$50.

May 11—Chas. Kesling. Fined \$50.

May 11—Thos. Roberts. Fined \$50.

May 11—John Lunes. Fined \$50.

May 11—George Journess. Fined \$50.

May 19—John Golitto. Jail fifty days.

May 19—Joseph Pogue. Jail fifty days.

June 7—Nicholas Barra. Fined \$50.

June 7—Constine Janullo. Fined \$50.

June 7—Josey McCorea. Fined \$50.

June 7—Alex. Peters. Fined \$50.

June 7—Alex. Rozario. Fined \$50.

June 9—John Constine. Fined \$50.

June 9—Pappello Sofico. Fined \$50.

June 9—Christ. Sprego. Fined \$50.

June 9—George Allec. Fined \$50.

June 9—John Nicholas. Fined \$50.

June 16—Nicholas Christ. Fined \$50.

June 16—Nicholas Columbus. Fined \$50.

August 15—Joseph Largomorisina, Antone Petro, Manuel Gappie, Joseph Penio, Manuel Tarkenka. Held for stealing a cow from Walter Storey of Chipp's Island. Case set for November 15, 1884.

August 29—John Starbo. Fined \$50.
 August 29—Manuel Dorris. Fined \$50.
 August 29—Henry Richardson, A. Mastillo, Peter Holker. Jailed.
 August 29—John Bell. Fined \$50.
 August 29—Niel Nelson. Fined \$50.
 August 29—Chas. Summon, Andrew Faruseh, Martin Busion. Not guilty by jurors.
 September 16—Antone Bragell. Fined \$50.
 September 16—A. Andrews. Fined \$50.
 September 16—F. Bayo, A. Bosco. Jailed.
 September 25—John Spodd. Fined \$50.
 September 25—M. Calighan. Fined \$50.
 September 30—Romaro Francisco, Frank Rittie. Jailed.
 October 4—Ah Shun, Gom Lee, Tom Tough, Ah True. Jailed.

Total amount collected for fines, \$2,000.

The foregoing report does not include some forty arrests that I made during the fourteen months that I have been under the employment of the Fish Commissioners. By the partiality of the jurors, and in some cases not having sufficient evidence to convict, many of the violators escaped justice.

The best evidence that I have to offer in the interest of the good accomplished by the river patrol, is the small amount of violations now being committed of the existing fish laws. It is a well known fact that previous to the establishment of an efficient patrol on the rivers and bays, fishermen carried on their unlawful business without restraint.

The following is the number of convicted violators of the law as regards nationality:

Greeks	45
Italians	23
Germans	6
Americans	1
Chinese	18
Total	93

I hereby certify the above report to be correct.

W. C. JONES,
 Deputy Fish Commissioner.

HISTORY OF FISH CULTURE.

1850—French Government appointed a Fish Commission.

1850—Norwegian Parliament voted 3,000 thalers for the culture of fish.

1854—Belgian Government organized a fish-breeding establishment on the same principle as France.

1856—Massachusetts appointed a Fish Commission to inquire and report; the result was, that in 1865 the State adopted the present system and granted appropriations.

1857—Russia appointed a Fish Commission; the result of their labor culminating in the establishment in 1862 of a government breeding place in Finland, and by the year 1873 there were ten such in that province.

1860—Russia also subsidized an extensive hatchery at Nicholasky, in the Province of Novgorod.

1865—The State of New Hampshire sent commissioners to Canada for salmon ova. From 1865 to 1870, the State expended some \$23,000 for fish culture.

1865—The Austrian Government founded a fish hatchery at Saltzburg, and in 1873, every province in the empire was provided with its own breeding establishments.

1866—The State of Pennsylvania organized a Fish Commission, but no money was appropriated until the year 1873; but between the years 1873 to 1880 inclusive, the amount given through State aid was, for the purpose of public fish culture, nearly \$100,000.

1866—The State of Connecticut appointed a Fishery Commission, and appropriated for the purpose of public fish culture, from 1868 to 1880, \$44,500.

1866—The Dominion of Canada established a Fishery Commission with a large staff of officers, with ample funds at their command.

1867—The State of Maine appointed a Fish Commission. From 1867 to 1880, appropriations were made to the amount of \$38,000.

1868—The State of New York appointed a Commission of Fisheries, and from 1868 to 1879, expended the sum of \$169,000.

1870—The State of California appointed a Commission of Fisheries, and from 1870 to 1882, appropriated the sum of about \$40,000.

1870—The State of New Jersey appointed a Fishery Commission, and from 1871 to 1880, the appropriations were about \$30,000.

1870—Rhode Island appointed a Commission for Fish Culture, and from 1871 to 1880, appropriated \$10,000.

1870—Alabama appointed a Fish Commission.

1871—The Congress of the United States of America appointed a Commission of Fish and Fisheries, for all the States of the Union, with a full staff of officers having a knowledge of Fish Culture, and up to 1880, the total sums placed at the disposal of the Commission amounted to about \$488,500.

1871—The American Fish Culturist Association organized, and in 1872 applied to Congress to authorize the United States Commission to undertake the duty of restoring fish to the depleted rivers, and a resolution was passed authorizing the United States Commission to fulfill that duty.

1872—At Bucksport, State of Maine, an extensive breeding place was established at the joint expense of certain States and the United States Commission, under the control of the United States Commission.

1873—The State of Ohio appointed a Fish Commission, and from 1873 to 1880 the sums voted for fish culture amounted to nearly \$29,500.

1873—The State of Wisconsin appointed a Fish Commission, and from 1873 to 1880 the sum voted for fish culture amounted to about \$40,000.

1874—The State of Iowa appointed a Fish Commission, and from 1874 up to 1880 money was appropriated for the artificial culture of fish amounting to \$23,500.

1875—The New York Commission succeeded in hatching sturgeon, and were very successful.

1875—The State of Minnesota appointed a Fish Commission, and from 1875 to 1880, sums were appropriated amounting to \$23,000.

1876—The State of Kentucky appointed a Commission of Fisheries, and from 1876 to 1880 the various sums appropriated for fish culture were, in total, \$11,000.

1877—The State of Kansas appointed a Fish Commission, and from 1877 to 1880 appropriated for fish culture the sum of \$2,500.

1877—Germany and the United States were successful in the artificial hatching of herring.

1877—United States successfully introduced three species of carp from Germany.

1877—United States Congress established a Government carp pond by special appropriation, from which pond several hundred thousand carp have been distributed to all parts of the United States.

1877—The State of Colorado established a Fishery Commission, and from 1877 to 1880 appropriated for fish culture the sum of \$2,000.

1877—The State of Nevada appointed a Fish Commission, and from 1877 to 1880 the sum of \$2,500 was appropriated.

1877—West Virginia appointed a Commission of Fisheries, and from 1877 to 1880 there was appropriated for fish culture about \$4,000.

1877—There was one salmon caught in the Delaware River, and in 1878 there were several hundred taken.

1876—Salmon were planted in the Connecticut River, and in 1878 the fishermen caught more than six hundred.

1878—Sole were introduced by the United States Commission into the United States.

1878—Codfish were successfully hatched on the coast of Massachusetts by the United States Commission of Fisheries.

1879—Haddock were successfully hatched, in large numbers, by the United States Commission of Fisheries on the coast of Massachusetts.

1880—The United States Government built and equipped a large steam vessel for the transportation of fish.

1880—Spanish mackerel and other species of European fish were introduced by the United States Commission.

1880—Countries to which prizes were awarded at the Berlin International Exhibition, were as follows:

United States: Six gold medals, one silver, one bronze, and two honorable mentions.

Germany: Three gold, one silver, three bronze, and eleven honorable mentions.

Russia: One gold, one silver, one bronze, and one honorable mention.

Norway: One silver medal.

Sweden: One silver medal.

Austria: One bronze medal.

Switzerland: One bronze medal.

The people of the United States may well feel proud of the awards above mentioned. It shows that the people of the United States are the most progressive, energetic, and in fact the foremost in the art of fish culture. To-day, in such respect, the United States takes the lead of all other countries in the civilized world, and it is to be sincerely hoped that she will continue to maintain the supremacy.

REPORT OF TREASURER.

To the Commission of Fisheries of the State of California:

Appended find your Treasurer's statement and reports of receipts and disbursements from March 3, 1883—at which time the present Board was organized—up to December 3, 1884.

As to receipts, to the extent they have come from State appropriations, in this report will be found, in consecutive order, the number, date, and amount of each of the Controller's warrants.

The accounts covered by these warrants were presented to and approved by the State Board of Examiners, and are now on file in the proper State department.

All other disbursement accounts were paid by bank checks, and, on settlement of the bank account, these paid checks have been returned, and are now on file as vouchers.

Having given to the fish industry of California, personally and as one of the Commissioners, much consideration, I deem it not inappropriate for me, in this report, to present a few suggestions.

In order to protect and increase the fish industry, I suggest that an appropriation of \$3,000 be solicited from the ensuing Legislature, to enable the Fish Commissioners to purchase a swift steam launch, by means of which the Commission and its patrol may successfully pursue, overtake, arrest, and bring to punishment all violators of the fish laws, and to drive the Chinese and other offenders from our bays and rivers.

I further suggest that the State appropriate \$10,000 to be expended by the Board of Fish Commissioners in the establishment and construction of a State salmon hatchery—the hatchery to be erected at an available site on one of the upper tributaries of the Sacramento River. The hatchery should have a hatching capacity of 6,000,000, with ample storage reservoirs for the safety of the young fry, until, by size, they can protect themselves from the devouring large fish. It is reported by the United States Fish Commissioner that from September, 1873, to November, 1882, 18,337,000 young salmon were released from the United States hatchery into the McCloud River, a tributary of the Sacramento. Whilst I have much reason to question the statement

as to numbers, I fully appreciate the obligation of our citizens to the Government of the United States and her Commissioners for a very generous and valuable supply. The General Government having practically, if not positively abandoned all work of supply in the direction mentioned, the State must do it or lose the salmon.

In my judgment this branch of *fish culture* demands immediate and active attention of the Commission and the Legislature.

I further suggest that a "boat license law" be enacted, requiring all persons and parties known as market or cannery fishermen, and those engaged in catching fish to dry, salt, or transport, to pay a license tax upon each boat used by them in their vocation. Such law will have the approval of the law abiding fishermen.

I further suggest that the State appropriate, for the thirty-seventh fiscal year, \$7,000, and for the thirty-eighth fiscal year, \$6,000, and that a special appropriation of about \$1,000 be made to cover the deficiencies of the thirty-fifth and thirty-sixth fiscal years.

Submitted.

A. B. DIBBLE,
Commissioner and Treasurer.

MISCELLANEOUS RECEIPTS AND DISBURSEMENTS.

Date.		Amount.
1883.	<i>Receipts.</i>	
March 3-----	Cash received from former Commission, deposited with Anglo-Californian Bank-----	\$6,504 11
March 3-----	Cash from estate of Traylor-----	21 28
June 26-----	Cash returned by J. D. Redding-----	97 40
November 9-----	Cash returned by J. D. Redding-----	55 00
1884.		
February 19---	Cash from Sacramento River Packing Company-----	200 00
		<u>\$6,877 79</u>
1883.	<i>Disbursements.</i>	
March 5-----	Paid J. G. Woodbury, labor account-----	\$230 25
March 10-----	Paid Francis & Valentine, printing annual report and express'ge-----	54 25
March 12-----	Paid Wells, Fargo & Co., freight on eggs from East-----	60 00
March 15-----	Paid Livingstone Stone, 4,000,000 salmon eggs-----	2,000 00
March 24-----	Paid J. G. Woodbury, salary and expenses-----	44 00
April 2-----	Paid R. H. Buckingham, expense account-----	10 00
April 10-----	Paid R. E. Wilson, counsel fee-----	100 00
April 18-----	Paid John Sissengood, balance labor account-----	15 00
April 25-----	Paid Wells, Fargo & Co., expressage-----	4 45
May 5-----	Paid J. D. Redding, expense account-----	40 00
June 9-----	Paid R. H. Buckingham, expense account-----	130 00
June 9-----	Paid A. B. Dibble, expense account-----	50 00
June 9-----	Paid J. D. Redding, expense account-----	125 00
July 4-----	Paid J. A. Richardson, salary and expense account-----	100 00
July 12-----	Paid Weisbien Bros., fish eggs-----	24 00
July 13-----	Paid J. G. Woodbury, expense account-----	18 00
August 14-----	Paid R. H. Buckingham, enforcing Section 634 Civil Code-----	500 00
July 19-----	Paid Peter Johnston, merchandise for hatchery-----	173 23
August 14-----	Paid J. D. Redding, expense account-----	40 00
August 8-----	Paid Mohawk Lumber Company, lumber-----	49 33
August 17-----	Paid J. A. Richardson, salary and expenses-----	100 00
August 18-----	Paid California Wire Works, wire-----	14 75
August 18-----	Paid J. D. Redding, expense account-----	210 00
August 20-----	Paid A. C. Lowell & Co., merchandise-----	20 00
	Amount carried forward-----	<u>\$4,112 26</u>

MISCELLANEOUS RECEIPTS AND DISBURSEMENTS—Continued.

Date.		Amount.
	Amount brought forward	\$4,112 26
August 31	Paid R. H. Buckingham, expense account	189 30
September 5	Paid Samuel Granger (for J. A. Richardson), labor account.....	50 00
September 10	Paid James Dobbins, for services and labor on river	539 50
September 10	Paid W. C. Jones, for services and labor on river	530 00
September 12	Paid J. A. Richardson, for services and labor on river	300 00
September 22	Paid A. B. Dibble, cash advanced and expenses	384 50
September 28	Paid H. S. Crocker & Co., printing	6 00
September 29	Paid R. H. Buckingham, expense account and Chinese prosecution, etc.	250 00
October 10	Paid R. H. Buckingham, expense account and Chinese prosecution, etc.	100 00
October 15	To Huntington, Hopkins & Co., merchandise	9 93
November 20	To H. Woodson, trout eggs	20 25
November 20	To A. B. Dibble, expense account	12 37
December 24	To A. R. Hamlin, labor account	90 00
December 31	To Wells, Fargo & Co., expressage	3 40
December 31	To discount on State warrant	18 76
1884.		
February 19	Paid C. H. Rogers, boat and service (Sacramento River Packing Company)	75 00
-----	Paid June, October, and December, 1884, discount on State warrants	53 27
-----	Paid, July, 1884, Wells, Fargo & Co., expressage	1 55
-----	Paid Mohawk Lumber Company, on bill omitted by error in claim No. 5.	12 75
		\$6,758 84
	Balance unexpended	118 95
		\$6,877 79

SUMMARY OF EXPENDITURES OF APPROPRIATION FOR THIRTY-FIFTH FISCAL YEAR.

	To appropriation		\$5,000 00
1883—October 29	1. By warrant No. 1,952	\$1,250 28	
December 21	2. By warrant No. 2,971	1,568 35	
1884—February	3. By warrant No. 3,969	552 00	
March 4	4. By warrant No. 4,334	180 00	
May 21	5. By warrant No. 6,835	763 70	
June 28	6. By warrant No. 7,136	544 20	
August 16	7. By warrant No. 536	* 141 47	
			\$5,000 00

* This is the amount paid of the claim for \$896 45—see below.

CONDITION OF APPROPRIATION FOR THIRTY-FIFTH FISCAL YEAR.

To claim No. 1—Expenses	\$1,250 28
To claim No. 2—Expenses	1,568 35
To claim No. 3—Expenses	552 00
To claim No. 4—Expenses	180 00
To claim No. 5—Expenses	763 70
To claim No. 6—Expenses	544 20
To claim No. 7—Expenses	896 45
	\$5,754 98
By amount drawn as above	5,000 00
Deficiency in appropriation to pay claim No. 7	\$754 98

STATEMENT IN DETAIL OF EXPENSES OF APPROPRIATION FOR THIRTY-FIFTH
FISCAL YEAR, BEGINNING JULY 1, 1883, AND ENDING JUNE 30, 1884.

Claim No. 1, August 6, 1883, to October 13, 1883, inclusive.

1. To W. C. Jones, patrol and expense account.....	\$664 65	
2. To R. H. Buckingham, expense account.....	163 38	
3. To Charles Donicke, boat and services.....	50 00	
4. To Carquinez Packing Company, tug service.....	80 00	
5. To S. Marsich, merchandise.....	25 80	
6. To Peter Terrillo, sloop and expenses.....	65 95	
7. To John J. Murphy, services.....	32 00	
8. To J. Grimley, labor on river.....	15 00	
9. To F. M. Angelotti, retaining fee.....	40 00	
10. To John Ferrin, services, cash, etc.....	103 50	
11. To D. Odds and Lot Smith, keepers' fees.....	10 00	
		<hr/> \$1,250 28

Claim No. 2, September 22, 1883, to November 20, 1883, inclusive.

1. To A. B. Dibble, expense account.....	\$187 40	
2. To R. H. Buckingham, expense account.....	133 60	
3. To W. C. Jones, labor and expenses.....	415 35	
4. To Livingstone Stone, salmon eggs.....	600 00	
5. To W. J. Hugh, board, etc.....	13 00	
6. To Frederick Buckingham, services.....	76 00	
7. To John Cropper, services.....	69 50	
8. To sloop Bessie, Captain Ferrella.....	73 50	
		<hr/> 1,568 35

Claim No. 3, November 11, 1883, to January 31, 1884, inclusive.

1. To J. N. Gill (W. C. Jones), merchandise.....	\$12 85	
2. To F. M. Angelotti, legal services.....	20 00	
3. To John Cropper, services.....	25 00	
4. To Jacob Cantrell, services.....	30 00	
5. To Charles Dagnol, services and boat.....	45 00	
6. To Wm. T. Wallace, Jr., legal services.....	80 00	
7. To R. H. Buckingham, expense account.....	102 15	
8. To D. H. Burton, labor, etc.....	110 00	
9. To W. C. Jones, labor and expenses.....	127 00	

Claim No. 4, February —, 1884.

To A. B. Dibble, expense account.....	\$180 00	
		<hr/> 180 00

Claim No. 5, January 8, 1884, to April 17, 1884, inclusive.

1. To J. D. Johnson, labor.....	\$18 00	
2. To W. C. Jones, services and expenses.....	113 50	
3. To Eureka Lumber Company, lumber.....	40 71	
4. To Peter Johnson, hardware.....	109 49	
5. To J. Shebley, services, etc.....	48 50	
6. To J. C. Frazier, one month's salary.....	100 00	
7. To J. Shebley, fish, expenses, and labor.....	95 55	
8. To R. H. Buckingham, expenses.....	118 40	
9. To J. C. Frazier, salary, expenses, etc.....	116 90	
10. To Mohawk Lumber Company, lumber.....	2 65	
		<hr/> 763 70

Claim No. 6, February 10 to May 9, 1884, inclusive.

1. To R. H. Buckingham, expense account.....	\$83 05	
2. To A. B. Dibble, expense account.....	333 85	
3. To J. C. Frazier, salary, expenses, etc.....	127 30	
		<hr/> 544 20

Claim No. 7, July 23 to December 11, 1884, inclusive.

1. To Lenni Fish Company, fish.....	\$125 00	
2. To J. A. Richardson, salary and expenses.....	328 50	
3. To H. Woodson, 25,000 trout.....	200 00	
4. To W. C. Jones, sloop and services.....	90 00	
5. To J. C. Frazier, salary, expenses, etc.....	107 95	
6. To John Healey, boat and services.....	45 00	
		896 45
Apportioned all that was received from the warrant.....		141 47
Total expenditures.....		\$5,000 00

NOTE.—Claim No. 7 allowed, \$896 45; balance in appropriation, \$141 47; deficiency, \$754 98.

EXPENDITURES FOR THIRTY-SIXTH FISCAL YEAR, ENDING JUNE 30, 1885.

To appropriation		\$5,000 00
<i>By expenditures, Claim No. 1, Warrant 537, July 6 to July 13, 1884, inclusive.</i>		
1. To J. C. Frazier, salary and expenses.....	\$178 30	
2. To W. C. Jones, salary and expenses.....	40 00	
3. To W. C. Jones, sloop and services.....	200 00	
4. To J. C. Frazier, expenses, Lake Tahoe.....	16 50	
		\$434 80
<i>Claim No. 2, Warrant 1,839, from July 1, 1884, to August 11, 1884, inclusive.</i>		
1. To J. Shebley, cash and labor.....	\$168 10	
2. To Bosqui, engraving and printing.....	25 00	
3. To W. C. Jones, salary and expenses.....	600 00	
4. To R. H. Buckingham, expense account.....	154 65	
		947 75
<i>Claim No. 3, Warrant 3,088, December 2, 1884.</i>		
1. To J. C. Frazier, services and expenses.....	\$247 95	
2. To W. C. Jones, services and expenses.....	160 00	
3. To R. H. Buckingham, expense account.....	98 35	
		506 30
4. To A. B. Dibble, expense account.....		365 04
		2,253 89
Balance unexpended		\$2,746 11

RECAPITULATION.

Receipts.

Miscellaneous	\$6,877 79
Appropriation thirty-fifth fiscal year.....	5,000 00
Appropriation thirty-sixth fiscal year.....	2,253 89
	\$14,131 68

Disbursements.

Miscellaneous	\$6,758 84
Thirty-fifth fiscal year.....	5,000 00
Thirty-sixth fiscal year.....	2,253 89
	14,012 73
Balance unexpended.....	\$118 95

DISTRIBUTION OF FISH, 1883.

- 5,000 trout in Butterfly Creek, above reservoir, Nevada County.
- 33,000 trout in the upper waters American River.
- 15,000 trout in Webber Lake.
- 5,000 trout in Butterfly Creek, below reservoir.
- 8,000 trout in San Bernardino County.
- 300 carp in Yolo County.
- 29,000 trout in Donner, Webber, and Independence Lakes.

DISTRIBUTION OF FISH, 1884.

25,000 trout in Sonoma Creek.
 30,000 trout in Modoc County streams.
 5,000 land-locked salmon in Independence Lake.
 10,000 land-locked salmon in Donner Lake.
 10,000 land-locked salmon in Bigler Lake.
 2,000 trout at Folsom.
 500 catfish at Fresno.
 10,000 trout in Bear River, Placer County.
 20,000 trout in South Yuba River.
 10,000 trout in American River.
 2,000 trout in stream at Nevada City.
 5,000 trout at Steep Hollow.
 10,000 trout in streams of Santa Clara County.
 10,000 trout in streams of Santa Cruz County.
 70,000 trout on hand for distribution at Shebley.
 600,000 salmon in Sacramento River.
 100,000 salmon-trout (eastern), now being hatched at Shebley.
 300 land-locked salmon in Butterfly Creek and above reservoir.

LIST OF FISH COMMISSIONERS.

UNITED STATES.

Prof. Spencer F. Baird Washington, D. C.

ALABAMA.

Col. D. R. Hundley Mooresville
 Hon. Charles S. G. Doster Prattville

ARIZONA.

Hon. J. J. Gosper Prescott
 Hon. Richard Rule Tombstone
 J. H. Taggart Yuma

ARKANSAS.

J. E. Reardon Little Rock
 J. H. Hornibrook Little Rock
 H. H. Rottaken Little Rock

CALIFORNIA.

J. D. Redding San Francisco
 A. B. Dibble, Secretary and Treasurer Grass Valley
 R. H. Buckingham, President Sacramento

COLORADO.

Wilson E. Sisty Idaho Springs

CONNECTICUT.

Dr. W. M. Hudson Hartford
 Robert G. Pike Middletown
 James A. Bill Lyme

DELAWARE.

Enoch Moore, Jr. Wilmington

GEORGIA.

Hon. J. T. Henderson.....Atlanta
 Dr. H. H. Cary, Superintendent of Fisheries.....

ILLINOIS.

N. K. Fairbank.....Chicago
 S. P. Bartlett.....Quincy
 S. P. McDole.....Aurora

INDIANA.

Calvin Fletcher.....Spencer, Owen County

IOWA.

B. F. Shaw.....Anamosa
 A. A. Mosher.....Spirit Lake

KANSAS.

W. S. Gale.....Venango

KENTUCKY.

William Griffith, President.....Louisville
 John B. Walker.....Madisonville
 P. H. Darby.....Princetown
 Hon. C. J. Walton.....Munfordville
 Hon. John A. Steele.....Versailles
 W. C. Price.....Danville
 Dr. William Van Antwerp.....Mount Sterling
 Hon. M. J. Chambers.....Independence, Kenton County
 A. H. Goble.....Collettsburg
 J. H. Malory.....Bowling Green

MAINE.

E. M. Stilwell.....Bangor
 Henry O. Stanley.....Dixfield

MARYLAND.

G. W. Delewader.....Oakland
 Thomas Hughlett.....Easton

MASSACHUSETTS.

E. A. Brockett.....Winchester
 E. H. Lathrop.....Springfield
 F. W. Putnam.....Cambridge

MICHIGAN.

Dr. J. C. Parker, President.....Grand Rapids
 A. J. Kellogg.....Detroit
 J. H. Bissell.....Detroit

MINNESOTA.

First District—Daniel Cameron.....La Crescent
 Second District—William W. Sweeney, M.D.....Red Wing
 Third District—R. Ormsby Sweeney, President.....St. Paul

MISSOURI.

John Reid.....Lexington
 J. G. W. Steedman, Chairman.....2803 Pine Street, St. Louis
 J. S. Logan.....St. Joseph

NEBRASKA.

R. R. Livingston Plattsmouth
 W. L. May Fremont
 B. E. B. Kennedy Omaha

NEVADA.

Hon. Hub. G. Parker Carson City

NEW HAMPSHIRE.

George W. Riddle Manchester
 Luther Hayes South Milton
 Elliott B. Hage Plymouth

NEW JERSEY.

Theo. Morford, President Newton
 Richard Jenkins Camden
 William Wright Newark

NEW YORK.

Hon. R. Barnwell Roosevelt, President 76 Chambers Street, New York
 Gen. Richard U. Sherman, Secretary New Hartford
 Edward M. Smith Rochester
 Eugene G. Blackford No. 80 Fulton Market, New York

NORTH CAROLINA.

S. G. Worth Raleigh

OHIO.

Col. L. A. Harris, President Cincinnati
 Charles W. Bond, Treasurer Toledo
 Halsey C. Post, Secretary Sandusky

PENNSYLVANIA.

Hon. B. L. Hewitt Hollidaysburg
 James Duffy Marietta
 John Hummel Silingsgrove
 G. M. Miller Wilkesbarre
 John Gay Greensburg
 Arthur Maginnis Swiftwater

RHODE ISLAND.

John H. Barden Rockland
 Henry I. Root Providence
 Col. Amos Sherman Woodsocket

SOUTH CAROLINA.

Hon. A. P. Butler Columbia
 C. J. Huske Columbia

TENNESSEE.

W. W. McDowell Memphis
 H. H. Sneed Chattanooga
 Edward D. Hicks Nashville

TEXAS.

John H. Lubock Austin

VERMONT.

Hiram A. Cutting..... Lunenburg
Herbert Brainard..... St. Albans

VIRGINIA.

Colonel Marshall McDonald..... Berryville

WEST VIRGINIA.

Henry B. Miller, President..... Wheeling
C. S. White, Secretary..... Romney
N. M. Lowry..... Hinton

WISCONSIN.

The Governor, Wm. E. Smith, ex officio..... Madison
Philo Dunning, President..... Madison
C. L. Valentine, Secretary and Treasurer..... Janesville
J. V. Jones..... Oshkosh
John F. Antisdel..... Milwaukee
Mark Douglas..... Melrose, Jackson County
C. Hutchinson..... Beetown, Grant County

WYOMING TERRITORY.

Dr. M. C. Barkwell, President..... Cheyenne
Otto Gramm, Secretary..... Laramie
N. L. Andrews..... Jackson County
E. W. Bennett..... Carbon County
P. J. Downs..... Uinta County
T. W. Quin..... Sweetwater County

WASHINGTON TERRITORY.

Albert B. Stream..... North Cove

DOMINION OF CANADA.

W. H. Witcher, Commissioner..... Ottawa, Ontario

PROVINCE OF NEW BRUNSWICK.

W. F. Venning, Inspector of Fisheries..... St. John

PROVINCE OF NOVA SCOTIA.

W. H. Rogers, Inspector..... Amherst

PROVINCE OF PRINCE EDWARDS ISLAND.

J. H. Duvar, Inspector..... Alberton

PROVINCE OF BRITISH COLUMBIA.

A. C. Anderson..... Victoria

SCOTCH FISHERIES IMPROVEMENT ASSOCIATION.

His Grace the Duke of Sutherland, President.
The Right Hon. the Earl of Breadalbane, Vice-President.
The Right Hon. the Earl of Dalhousie.
The Right Hon. Lord Polworth.
David Milne Home, Esq., of Milne Gordon.

COUNCIL.

The Right Hon. the Earl of Leven and Melville.
The Right Hon. Lord Abinger.
Major-General A. McDonald, of Dalhousie.

E. A. Stewart Gray, Esq., of Gray & Kinfauns, Chairman of Tay District Board.
 J. Maxtone Graham, Esq., of Cultoquhey.
 Archibald Young, Esq., Inspector of Salmon Fisheries of Scotland, Edinburgh.
 David Lang, Esq., W. S., President of the Edinburgh Angling Club.
 J. W. Young, Esq., W. S., Edinburgh.
 J. F. Cathcart, Esq., Edinburgh.
 John Clark, Esq., Secretary of the Echaig Angling Club, Glasgow.
 J. A. Harvie Brown, Esq., of Quarter and Shingarton.
 William Menzies, Esq., Secretary of the Edinburgh Angling Club.
 George H. Handasyde, Esq., Edinburgh.
 J. Barker Duncan, W. S., Hon. Secretary, No. 6, Hill Street, Edinburgh.

SALMON CANNERIES OBTAINING FISH FROM THE SACRAMENTO.

Banner Packing Company	San Francisco
Benicia Packing Company	P
Booth & Co. Packing Company	Col.
Booth & Co. Packing Company	Chipp's
S. Booth & Co. Packing Company	Black Diamond
W. B. Bradford Packing Company	Col.
Carquinez Packing Company	Bel
Chas. Taylor & Co.	El V.
Cutting Packing Company	Martinez
Courtland Packing Company	Courtland
Capital Packing Company	Sacramento
Columbus Packing Company (F. M. & Co.)	San Francisco
Columbus Packing Company	San Francisco
Jones & Anderson	Sacramento
King, Morse & Co.	Black Diamond
Red Cross Packing Company	San Francisco
Robt. Carter & Co.	Rio Vista
Suisun Packing Company	Suisun Bay
Sacramento River	Chipp's Island
Occident and Orient	Smith's River
Pacific Coast	Eel River

The increase since 1879 in the number of outfits for the taking of salmon, and especially in 1883 and 1884, have nearly trebled, the nets and boats increasing from two hundred and twenty to over fifteen hundred. The nets now have an average length of over three hundred fathoms or eighteen hundred feet each.

The cost of running the different canneries varies considerably, owing to various causes, mainly:

First—Capacity.

Second—Structure.

The cost of running the canneries will average about \$50,000 each per annum.

The cost of each net is about on an average of \$200. The nets have to be renewed annually, or sooner, owing to wear and tear and accidents.

The cost of fishermen's boats average \$200 each on the lower end of the river, while the boats on the upper river, being principally skiffs, cost about \$40 each.

CANNERIES ON THE COLUMBIA.

Showing the immense production of food from salmon.

Aberdeen Packing Company, Quilwact, Oregon	27,500 cases
Adair Packing Company, Astoria, Oregon	11,000 cases
Astoria Packing Company, Astoria, Oregon	20,000 cases
Anglo-American Packing Company, Astoria, Oregon	12,500 cases
Bactolet & Co. Packing Company, Astoria, Oregon	24,000 cases
D. Morgan J. R. Packing Company, Astoria, Oregon	
A. Booth & Co. Packing Company, Astoria, Oregon	
Columbia Canning Company, Washington Territory	16,200 cases
Columbia River Packing Company, Astoria, Oregon	
John A. Devlin & Co., Astoria, Oregon	26,000 cases
Eureka Packing Company, Eureka, Washington Territory	20,000 cases
Samuel Elmore Packing Company, Astoria, Oregon	10,000 cases
Fishermen's Packing Company, Astoria, Oregon	17,500 cases
Hapgood & Co. Packing Company, Waterford, Oregon	10,000 cases
Hartshorne & Co. Packing Company, Astoria, Oregon	16,000 cases
R. D. Hume Packing Company, Astoria, Oregon	14,000 cases
William Hume Packing Company, Astoria, Oregon	16,000 cases
William Hume Packing Company, Eagle Cliff, Washington Territory	

I. X. L. Packing Company, Astoria, Oregon	8,500 cases
Knappton Packing Company, Knappton, Washington Territory	8,500 cases
George T. Meyers & Co., Rainet, Oregon	15,000 cases
J. G. Megler Packing Company, Brookfield, Washington Territory	20,000 cases
Ocean Packing Company, Bay View, Washington Territory	13,000 cases
Oregon Packing Company, Clifton, Oregon	
Occident Packing Company, Astoria, Oregon	15,000 cases
Union Pacific Packing Company, Astoria, Oregon	15,500 cases
Point Adams Packing Company, Astoria, Oregon	
Pillar Rock Packing Company, Pillar Rock, Washington Territory	12,500 cases
Scandinavian Packing Company, Astoria, Oregon	18,500 cases
Sea Side Packing Company, Astoria, Oregon	10,800 cases
White Star Packing Company, Astoria, Oregon	16,500 cases
Union Packing Company, Astoria, Oregon	20,800 cases
W. Co. Packing Company, Hungry Harbor, Oregon	16,000 cases
West Coast Packing Company, Astoria, Oregon	16,000 cases
Williams & Co. Packing Company, Astoria, Oregon	8,900 cases
W. & Knowles Packing Company, Astoria, Oregon	18,000 cases
Warren & Co., Cascades, Oregon	} 10,000 cases
W. & Co., Cascades, Oregon	
Whitton Company, Astoria, Oregon	14,000 cases
Wish Canning Company, Gardner, Oregon	
Gardner Packing Company, Gardner, Oregon	
Jas. Williams, Tacoma, Washington Territory	
Puget Sound Cannery, Milton, Washington Territory	
R. D. Hume, Rogue River, Oregon	
Tillamook Packing Company, Hobsonville, Oregon	
Washington Packing Company, Grey's Harbor, Oregon	

BRITISH COLUMBIA AND ALASKA CANNERIES.

Balmoral Canning Company, Skeena River	
British America Canning Company, Canoe Pass	
British Columbia Canning Company, New Westminster	
British-American Canning Company, Skeena River	
British Union Packing Company, Ladner's Landing, British Columbia	
Cape Fox Packing Company, Cape Fox, Alaska	
Chilkat Packing Company, Chilkat, Alaska	
Cutting Packing Company, Cook's Inlet	
Delta Packing Company, Ladner's Landing, British Columbia	
Douglas Packing Company, Nass, British Columbia	
E. A. Wadhams Packing Company, Excelsior Landing, British Columbia	
English & Company Packing Company, New Westminster, British Columbia	
Ewen Packing Company, New Westminster, British Columbia	
Findley & Company Packing Company, Deas Island, British Columbia	
Inverness Packing Company, Inverness, British Columbia	
Joseph Spratt Floating Cannery, —, British Columbia	
Karluck Floating Cannery, Kodiak Island, Alaska	
Laidlaw & Company, Lapperton, British Columbia	
Mettakath, Mettakath, British Columbia	
Nass River Fishing Company, Nass River, British Columbia	
Nimkish Cannery, Alert Bay, British Columbia	
North Pacific Trading Company, Kalawack, Alaska	
Richmond Canning Company, North Arm, British Columbia	
River Inlet Canning Company, Queen Charlotte Sound, British Columbia	
Robert Cunningham Canning Company, Coquitlan, British Columbia	
Wachusett Canning Company, Alaska	
Wellington Canning Company, Wellington Landing, British Columbia	
Windsor Canning Company, Aberdeen, British Columbia	
Quashela Packing Company, Skeena River	
Wanmuck Packing Company, River Inlet	

Respectfully submitted.

R. H. BUCKINGHAM,
A. B. DIBBLE,
Fish Commissioners.

REPORT

OF THE

Board of Trustees of the State Normal Schools

FOR THE

Years ending June 30, 1883, and June 30, 1884.



SACRAMENTO:

STATE OFFICE.....JAMES J. AYERS, SUPT. STATE PRINTING.
1884.

REPORT OF THE TRUSTEES OF THE STATE NORMAL SCHOOL.

To his Excellency GEORGE STONEMAN, Governor:

SIR: In accordance with the requirements of the Political Code, we have the honor to submit the report of the schools under our charge, for the thirty-fourth fiscal year, ending June 30, 1883, and the thirty-fifth fiscal year, ending June 30, 1884.

For a statement of the disbursements of the moneys under our control, we beg leave to refer your Excellency to the several reports of the Secretary of the Board, and for a summary of the scholastic work of the schools to the reports of the Principals, all of which are herewith transmitted.

The appropriations made by the last Legislature for the current expenses in the Normal School and in the Branch Normal School, and for completing and furnishing the Branch Normal School building, have been sufficient to accomplish the ends for which they were made. The appropriation of \$1,000 for improving the grounds of the Branch School, made only a fair beginning. We are confident that an examination of the financial reports will show that all moneys have been economically used, and that the Principal's reports will show that the work of the schools has been excellent.

We can only say for the future that the same care will be exercised in every expenditure, and the same effort made to secure for the State a full equivalent for all moneys expended.

We give below the estimates of appropriations needed to carry on the schools for the coming two years. These estimates have been carefully made, and the amounts cannot be reduced without impairing the usefulness of the schools:

NORMAL SCHOOL, SAN JOSÉ.

For current expenses	\$76,000
For increasing water supply and care of grounds	4,000
For painting and repairing building	1,500
For additional cases for museum	500
Total	\$82,000

BRANCH NORMAL SCHOOL, LOS ANGELES.

For current expenses	\$32,000
For additional furniture	1,000
For addition to library	1,000
For cases in museum	1,000

And a reasonable sum, to be determined by the Legislature, for fencing and improving grounds.

We have the honor to be, very respectfully, your obedient servants,

RALPH LOWE,
Vice-President Board of Trustees.

CHAS. H. ALLEN, Secretary.

REPORTS

OF THE

SECRETARY, PRINCIPAL, AND VICE-PRINCIPAL,

For the Thirty-fourth Fiscal Year.

FINANCIAL REPORT

Of the California State Normal School, at San José, for the Thirty-fourth Fiscal Year, ending June 30, 1883.

Date of Auditing.		Dr.	Cr.
1882.			
	Amount of appropriation for thirty-fourth fiscal year	\$30,000 00	
	Balance of tuition money on hand July 1, 1882	2,280 64	
	Amount of tuition collected for term ending December 21, 1882	1,914 05	
	Amount of tuition collected for term ending May 31, 1883	1,610 85	
Aug. 5	Amount paid Janitor and Curator, salaries for July		\$120 00
Aug. 23	Amount paid for salaries for August, 1882		3,205 00
Aug. 23	Amount paid J. R. Brierly, advertising Normal School in Los Angeles "Normal"		15 00
Sept. 26	Amount paid for salaries, September, 1882		3,205 00
Oct. 21	Amount paid for salaries, October, 1882		3,205 00
Oct. 21	Amount paid Gilbert & Moore, desks and freight		77 88
Oct. 21	Amount paid Farmers' Union, janitor supplies		28 55
Oct. 21	Amount paid San José Furniture Manufacturing Company, stools and repairs		9 65
Oct. 21	Amount paid Geo. B. McKee & Co., paints		2 05
Oct. 21	Amount paid A. Waldteufel, Encyclopedia Britannica, Vol. 14		10 50
Oct. 21	Amount paid Geo. Denne & Co., frames and mt'ng maps		5 75
Oct. 21	Amount paid Henry Laurilliard, tuning piano		5 00
Oct. 21	Amount paid A. D. T. Co., box rent and messengers		9 50
Oct. 21	Amount paid S. A. Wilson, express for Museum		3 25
Oct. 21	Amount paid J. C. Corcoran, plumbing repairs		74 36
Oct. 21	Amount paid E. H. Guppy, stationery		124 13
Nov. 23	Amount paid for salaries, November, 1882		3,205 00
Dec. 21	Amount paid for salaries, December, 1882		3,205 00
Dec. 21	Amount paid San José Gas Co., gas		58 80
Dec. 21	Amount paid Daunes & Van Doren, coal		292 64
Dec. 21	Amount paid Wm. Vinter, iron chimney		12 00
Dec. 21	Amount paid Wm. Grey, repairing boiler		5 00
Dec. 21	Amount paid James T. White, mounting chart		2 00
Dec. 21	Amount paid Farmers' Union, janitor supplies		9 07
Dec. 21	Amount paid W. Fanning, moving seats		4 50
Dec. 21	Amount paid J. B. Golly, kindergarten set		1 70
Dec. 21	Amount paid Robt. Adcock, carrying mail five months		20 00
Dec. 21	Amount paid C. H. Allen, postage, box rent, and sund'rs		50 30
1883.			
Jan. 18	Amount paid for salaries, January, 1883		3,305 00
Jan. 18	Amount paid Daunes & Van Doren, coal		285 44
Jan. 18	Amount paid C. Sproat, repairs to electric apparatus		25 00
Jan. 18	Amount paid E. H. Guppy, stationery		155 62
Jan. 18	Amount paid Shaw & Callisch, chemicals		40 30
Jan. 18	Amount paid F. Kuchenbeiser, repairs to furnace		12 50
Jan. 18	Amount paid B. J. Rhodes, prism bottle		6 00
Jan. 18	Amount paid S. J. D. T. Co., box rent		7 50
Jan. 18	Amount paid Otto Finger, salary one month to Jan. 8		60 00
Jan. 18	Amount paid Gens Nissen, salary one month to Jan. 8		50 00
Jan. 18	Amount paid estate of Geo. A. Stone, shrubs and plants		36 75
Jan. 18	Amount paid McNeil Bros., printing and binding		12 50
Jan. 18	Amount paid W. K. Beans, cultivator		10 00
Jan. 18	Amount paid J. B. Morey, hay		7 25
Feb. 23	Amount paid for salaries, February, 1883		3,305 00
Feb. 23	Amount paid Daunes & Van Doren, coal		97 49
Feb. 23	Amount paid E. H. Guppy, stationery		33 73

FINANCIAL REPORT—Continued.

Date of Auditing.		Dr.	Cr.
1883.			
Feb. 23	Amount paid Pacific School Journal, advt. six months		\$50 00
Feb. 23	Amount paid J. C. Corcoran, plumbing		15 32
Feb. 23	Amount paid B. J. Rhodes, chemical bottles		13 25
Feb. 23	Amount paid Farmers' Union, janitor supplies		12 97
Feb. 23	Amount paid Platt Gregory, tables		10 75
Feb. 23	Amount paid A. S. Barnes, Mag. Am. History, 1883		5 00
Feb. 23	Amount paid F. Kuchenbeiser, repairs to furnace		\$28 50
Feb. 23	Amount paid Hines & Belknap, earth per contract		149 60
Feb. 23	Amount paid gardeners, salaries one month to Feb. 8		110 00
Feb. 23	Amount paid L. Ross & Son, grass seed		49 30
Feb. 23	Amount paid J. B. Morey, hay		9 35
Feb. 23	Amount paid L. Scheller, gravel and manure		7 00
Mar. 20	Amount paid for salaries, March, 1883		3,305 00
Mar. 20	Amount paid E. H. Guppy, stationery		59 89
Mar. 20	Amount paid gardeners, salaries one month, to March 8		110 00
Mar. 20	Amount paid Henry B. Alvord, hardware		11 67
Mar. 20	Amount paid Geo. Denne & Co., electrotype		2 50
Mar. 20	Amount paid Herald Co., advertisement for earth		2 00
Apr. 19	Amount paid for salaries, April, 1883		3,305 00
Apr. 19	Amount paid sundry persons, payroll for labor on grounds		69 50
Apr. 19	Amount paid gardeners, salaries one month, to April 8		110 00
Apr. 19	Amount paid E. H. Guppy, stationery		37 85
Apr. 19	Amount paid San José Foundry, grates for furnace		33 06
Apr. 19	Amount paid Farmer's Union, janitor supplies		6 66
Apr. 19	Amount paid Luther, Schroeder & Co., grass seed		5 00
Apr. 19	Amount paid David Walsh, horseshoeing and repairs		3 25
May 26	Amount paid for salaries, May, 1883 (discounted per order of Board)		2,644 00
May 26	Amount paid gardeners, salary two mons. to June 8, '83		220 00
May 26	Amount paid A. Hansen, work on grounds		27 00
May 26	Amount paid C. H. Allen, postage, express, etc.		73 20
May 26	Amount paid C. H. Allen, sundry small bills		58 60
May 26	Amount paid E. H. Guppy, stationery		50 75
May 26	Amount paid J. C. Corcoran, plumbing		11 05
May 26	Amount paid J. Boschen, padlocks		8 75
June 21	Amount paid Janitor and Curator, salaries for June, 1883		120 00
June 21	Amount paid gardeners, salary one month, to July 8		110 00
June 21	Amount paid Henry B. Alvord, tools and hardware		14 30
June 21	Amount paid Gilbert & Moore, wands for tr. school		6 00
June 21	Amount paid Farmer's Union, janitor supplies		3 40
June 21	Amount paid C. H. Allen, commencement expenses		87 00
June 21	Amount paid L. Lion, matting		33 80
June 21	Amount paid E. H. Guppy, blank books, etc.		7 60
July 2	Amount paid sundry persons, twenty per cent deducted from May salaries		84 00
July 2	Amount paid Farmer's Union, janitor supplies		3 85
July 2	Amount paid San José Gas Company, gas six months		134 05
August 16	Amount paid Bank of San José, express on coin		14 95
	Balance		154 07
	Totals	\$35,805 54	\$35,805 54

SUMMARY OF ABOVE ACCOUNT.

	Dr.	Cr.
Total income for thirty-fourth fiscal year.....	\$35,805 54	
Amount expended for salaries of teachers and Janitor.....		\$32,213 00
Amount expended for stationery and books.....		509 81
Amount expended for fuel.....		675 57
Amount expended for janitor tools and supplies.....		75 25
Amount expended for furniture and matting.....		137 83
Amount expended for gas.....		192 85
Amount expended for A. D. T. Company's box rent and messengers.....		32 00
Amount expended for chemicals and chemical bottles.....		71 90
Amount expended for commencement.....		87 00
Amount expended for postage, box rent, mail carrying, express, etc.....		154 20
Amount expended for advertising Normal School.....		65 00
Amount expended for sundry repairs.....		226 44
Amount expended for miscellaneous items.....		28 25
Amount expended for salaries of gardeners.....		770 00
Amount expended for labor and sundries on grounds.....		412 37
Balance on hand, beginning of thirty-fifth fiscal year.....		154 07
Totals.....	\$35,805 54	\$35,805 54

FINANCIAL REPORT

Of the Branch State Normal School, Los Angeles, for the Thirty-fourth Fiscal Year, ending June 30, 1883.

Date of Auditing.		Dr.	Cr.
1882.			
	Amount of appropriation for support, thirty-fourth fiscal year	\$7,500 00	
Aug. 5---	Amount paid for irrigation and care of grounds, returned to Building Fund		\$223 25
Aug. 5---	Amount paid Thos. Clancey, work on grounds		40 50
Aug. 5---	Amount paid C. J. Flatt, traveling expenses, per order of Board		46 25
Sept. 9---	Amount paid for insurance on \$20,000		314 00
Sept. 9---	Amount paid Beaudry Waterworks, water		130 00
Sept. 9---	Amount paid W. C. Furrey, janitor supplies		17 20
Sept. 9---	Amount paid C. H. Allen, sundry small bills		54 25
Sept. 9---	Amount paid Thos. Clancey, work on grounds		94 75
Sept. 9---	Amount paid Phil. Hirschfeld, stationery		88 64
Sept. 26---	Amount paid for salaries, September, 1882		550 00
Oct. 21---	Amount paid for salaries, October, 1882		550 00
Oct. 21---	Amount paid C. W. Gibson, janitor supplies		3 10
Oct. 21---	Amount paid Los Angeles Times, advertising		1 50
Oct. 21---	Amount paid T. Clancey, labor, irrigating		14 00
Oct. 21---	Amount paid Wm. Johnson, labor on ditch		6 00
Nov. 23---	Amount paid for salaries, November, 1882		550 00
Nov. 23---	Amount paid C. H. Allen, traveling expenses to Los Angeles		90 00
Dec. 21---	Amount paid for salaries, December, 1882		550 00
Dec. 21---	Amount paid Walter S. Maxwell, coal		97 32
Dec. 21---	Amount paid Los Angeles Water Company, water for October		50 00
Dec. 21---	Amount paid Los Angeles Water Company, water for November		50 00
1883.			
Jan. 18---	Amount paid for salaries, January, 1883		550 00
Feb. 23---	Amount paid for salaries, February, 1883		550 00
Feb. 23---	Amount paid Los Angeles Water Company, water for December and January		100 00
Feb. 23---	Amount paid M. W. Childs, stove, hose, hardware, etc.		42 20
Mar. 20---	Amount paid for salaries, March, 1883		550 00
Mar. 20---	Amount paid Phil. Hirschfeld, stationery		19 40
Mar. 20---	Amount paid W. C. Furrey, hardware, tools, hose, etc.,		58 23
Apr. 19---	Amount paid for salaries, April, 1883		550 00
May 22---	Amount paid for salaries, May, 1883		550 00
May 26---	Amount paid Heinzelman & Ellis, chemicals		39 90
May 26---	Amount paid San Pablo Transfer Company, freight, hauling, etc.		8 50
May 26---	Amount paid J. D. Campbell, kerosene, etc.		5 00
May 26---	Amount paid C. H. Allen, expenses		5 90
May 26---	Amount paid for salaries, June, 1883		550 00
June 21---	Amount paid Los Angeles Water Company, water five months to July 1		250 00
June 21---	Amount paid Phil. Hirschfeld, stationery		33 60
June 21---	Amount paid Chas. Day, rent of organ		25 00
June 21---	Amount paid M. W. Childs, janitor supplies		19 94
June 21---	Amount paid W. C. Furrey, sundries		10 77
June 21---	Amount paid Mrs. J. D. Campbell, washing towels		8 50
June 21---	Amount paid C. J. Flatt, sundry small bills		52 30
	Totals	\$7,500 00	\$7,500 00

SUMMARY OF ABOVE ACCOUNT.

	Dr.	Cr.
Amount of appropriation -----	\$7,500 00	
Amount paid for salaries -----		\$5,500 00
Amount paid for irrigation and care of grounds -----		378 50
Amount paid for water -----		580 00
Amount paid for insurance -----		314 00
Amount paid for stationery -----		141 64
Amount paid for coal -----		97 32
Amount paid for janitor supplies -----		40 24
Amount paid for stove, tools, hose, hardware, etc. -----		100 43
Amount paid C. H. Allen and C. J. Flatt, traveling expenses -----		142 15
Amount paid for rent of organ -----		25 00
Amount paid for chemicals -----		39 90
Amount paid for miscellaneous items -----		140 82
Totals -----	\$7,500 00	\$7,500 00

REPORT OF EXPENDITURES

From Appropriation for Furnishing the Branch Normal School Building, for the Thirty-fourth Fiscal Year.

Date of Auditing.		Dr.	Cr.
1882.	Amount of appropriation.....	\$2,500 00	
Aug. 5---	Paid Dotter & Bradley, carpets and furniture.....		\$306 45
Aug. 5---	Paid Gilbert & Moore, seating and furniture.....		1,115 80
Sept. 9---	Paid Phil. Hirschfeld, dictionaries.....		48 00
Sept. 9---	Paid Platt & Page, five eight-day clocks.....		25 00
Sept. 9---	Paid Dotter & Bradley, door-mats and table.....		21 50
Sept. 9---	Paid Jas. W. Queen & Co., apparatus.....		194 10
Sept. 9---	Paid W. C. Furrey, janitor supplies and hardware.....		29 58
Sept. 9---	Paid C. H. Allen, slating and putting on.....		84 43
Sept. 9---	Paid putting up furniture, varnishing, etc.....		250 00
Oct. 21---	Paid W. C. Furrey, hardware.....		9 90
Oct. 21---	Paid Raphael Bros., mirrors, etc.....		6 15
Oct. 21---	Paid Herald Company, advertisement for furniture.....		4 50
Nov. 23---	Paid M. W. Childs, stoves, etc.....		92 40
Nov. 23---	Paid Alexander McEwen, set of outline maps.....		15 00
Nov. 23---	Paid Jas. T. White, Appleton's chart.....		10 00
Nov. 23---	Paid J. Verhave, putting on slating.....		3 50
1883.			
Mar. 20---	Paid J. D. Campbell, carpenter work on furniture.....		38 00
May 26---	Paid J. W. Redway, freight on apparatus and incidental expressage.....		71 26
May 26---	Paid Geo. B. McKee & Co., slating.....		6 00
May 26---	Paid J. W. Queen & Co., apparatus.....		168 43
	Totals.....	\$2,500 00	\$2,500 00

SUMMARY OF ABOVE ACCOUNT.

	Dr.	Cr.
Amount of appropriation.....	\$2,500 00	
Amount paid for furniture, carpets, and mats.....		\$1,737 90
Amount paid for apparatus.....		362 53
Amount paid for slating and putting on.....		93 93
Amount paid for clocks.....		25 00
Amount paid for dictionaries, maps, and charts.....		73 00
Amount paid for stoves, hardware, and janitor supplies.....		131 88
Amount paid for freight and incidentals.....		75 76
Totals.....	\$2,500 00	\$2,500 00

REPORT OF EXPENDITURES

From Appropriation for Improvement of Normal School Square, San José, Thirty-third and Thirty-fourth Fiscal Years.

	Dr.	Cr.
Amount of appropriation	\$25,000 00	
Amount received for sale of old fence	506 00	
Amount expended for labor and salaries		\$7,248 56
Amount expended for tools, and repairing tools		319 98
Amount expended for earth, gravel, loam, and manure		4,408 10
Amount expended for irrigation, including wells, tanks, barn, wind-mill, and irrigation pipes		3,835 57
Amount expended for boiler for engine		225 35
Amount expended for drainage		213 70
Amount expended for seeds and plants		660 74
Amount expended for iron fence		8,322 10
Amount expended for miscellaneous items		259 73
Balance transferred to General Fund		12 17
Totals	\$25,506 00	\$25,506 00

CHAS. H. ALLEN,
Secretary Board of Trustees.

SAN JOSÉ, June 30, 1883.

REPORT OF PRINCIPAL OF STATE NORMAL SCHOOL AT SAN JOSE.

To the Board of Trustees of the California State Normal School:

GENTLEMEN: I have the honor of submitting the following report of the school in San José, under your charge, for the school year ending May 31, 1883:

STATISTICAL.

During the year we have examined new pupils for admission, as follows:

For Senior Classes, 22; admitted, 9.

For Middle Classes, 101; admitted, 56.

For Junior Classes, 195; admitted, 185.

Total number examined, 318; admitted, 250; rejected, 68.

Graduates of high schools—admitted, 16.

Graduates of other institutions, 5.

Many of those admitted to the Junior Classes were pupils who had applied for admission to advanced classes. The majority of those rejected entered the Preparatory Class.

The new pupils examined represent forty-six counties of the State, besides six other States and Territories. During the year, forty-nine counties of California have had representatives in the school, distributed as follows: Alameda, 24; Alpine, 1; Amador, 6; Butte, 15; Calaveras, 4; Colusa, 5; Contra Costa, 17; El Dorado, 7; Fresno, 6; Humboldt, 12; Inyo, 1; Kern, 5; Lake, 2; Lassen, 2; Los Angeles, 1; Marin, 7; Mariposa, 1; Mendocino, 3; Merced, 7; Modoc, 1; Mono, 2; Monterey, 10; Napa, 5; Nevada, 15; Placer, 8; Plumas, 2; Sacramento, 11; San Benito, 9; San Bernardino, 2; San Diego, 11; San Francisco, 19; San Joaquin, 18; San Luis Obispo, 4; San Mateo, 3; Santa Barbara, 7; Santa Clara, 271; Santa Cruz, 30; Shasta, 3; Sierra, 4; Siskiyou, 1; Solano, 11; Sonoma, 10; Stanislaus, 3; Sutter, 7; Trinity, 1; Tulare, 5; Tuolumne, 8; Yolo, 12; Yuba, 2. Besides these, there have been from the State of Nevada, 5; from Oregon, 2; Washington Territory, 3; Arizona, 1; and Maine, 1. But three counties of California have not been represented during the year, namely: Del Norte, Tehama, and Ventura, and these have all had representatives in the school during previous years.

The highest enrollment during the year was 560, during February; average enrollment, 522; average daily attendance, 509; average percentage of attendance, 98; average percentage of punctuality, 99.

GENERAL.

The work of the school for the year just closed has been, in the main, entirely satisfactory. The school has been very large, and because of the number of classes, the Principal has been compelled to spend most of his time in class instruction—much of the time having

instructed five classes. This has left little time for supervision, but it has seemed necessary under the circumstances.

Section 1502 of the Political Code makes it the duty of the Principal to attend Teachers' Institutes, and lecture before them on subjects relating to public schools and the profession of teaching. Under the pressure of work here he has been compelled to decline most of the invitations extended to him. This he has done, feeling that he was serving the State better at his post in the school.

A large class is presented for graduation, numbering nearly enough to furnish each county with two teachers. We are confident that they will soon find employment, and hope each one will be a living argument in favor of Normal Schools.

The vacancy made in the Faculty by the extension of the leave of absence of Miss Titus, has been acceptably filled by Miss Isabella G. Oakley.

I have no recommendation to make, save the one made in my semi-annual report, that the Branch Normal School in Los Angeles should be supplied with an actual rather than a nominal Principal. For a detailed statement of the work of that school, I respectfully refer you to the report of Vice-Principal Flatt, who has had the immediate administration of the school, and who, at my request, has made a full report in the Catalogue and Circular of that school.

With thanks to the members of the Faculty for their faithful labors, and to you, gentlemen of the Board, for your cordial support, I subscribe myself, very respectfully,

Your obedient servant,

CHAS. H. ALLEN, Principal.

REPORT OF VICE-PRINCIPAL OF BRANCH NORMAL SCHOOL LOS ANGELES.

To the Board of Trustees of the California State Normal Schools:

GENTLEMEN: Through the suggestion of the Principal of the State Normal Schools, I make my report of the Branch State Normal School for the year ending June 15, 1883, directly to you.

The Branch Normal School was opened the twenty-ninth of August, 1882. The course of study was arranged the same as that of the State School, at San José, and the classes were formed under the same names; that is to say, the full course requires three years, and the pupils are to be comprised in six classes, six months apart in advancement. The classes are named, Junior B, Junior A, Middle B, Middle A, Senior B, Senior A. Pupils joining Junior B, will generally require three years to complete the course; Junior A, two and a half years, and so on. Eighty persons presented themselves for admission.

On examination, sixty-one were accepted; fifty-five without conditions, and six with conditions. Three classes were formed; Junior B, Junior A, and Middle B, besides a class for the six conditional pupils. These six pupils either removed their conditions, or joined the new Junior Class at the opening of the next session. The standard for admission was made the same as that for the school at San José. Pupils continued to apply during the session, and were examined and admitted. At the close of the term there were eighty-four pupils. Out of these, eighty-one were promoted, eleven conditioned, and three were required to remain in the same class for another session. The school closed its first session December twenty-third, and opened its second session January 8, 1883. Thirty-six new pupils were ready for examination. Of this number, twenty-six were accepted. A number of pupils have joined the school since. There are now on the roll one hundred and twenty-six pupils, classified as follows: Junior B, thirty-four; Middle B, twenty-seven; Junior A, thirty-eight; Middle A, twenty-seven. Whole number of pupils examined for admission or classification, one hundred and fifty-four; number rejected, twenty-eight; number admitted, one hundred and twenty-six. Graduates of high schools admitted, ten. Number of counties represented, fourteen.

This session, and the first year of the school, will close on the fifteenth of June. The next session will open with five classes, and the session after that with six, which will complete the organization. Two more rooms will be required during the coming year; therefore I recommend that the lease of the first floor be canceled at the close of this year.

The training school connected with this school, is in a prosperous condition. During the present session each pupil of the Middle A Class has been required to spend a considerable time in this school, observing its organization and the methods of teaching pursued in it. It is believed that this observation will enable the members of

this class to derive greater advantages from this required practice of teaching in this school next year. The training school has one hundred and fifty pupils. The rooms are overcrowded, and I recommend, therefore, that the number of pupils be limited to one hundred and twenty.

Experience in the State Normal School at San José has no doubt proved that the course of study is sufficiently extensive to be acquired in three years with the present standard of admission. It appears to me, however, that the requirements in the study of history are not sufficient. I, therefore, recommend that a knowledge of the ordinary text-book of the history of our country be added to the requirements for admission to the Junior Class, and that only the best method for teaching that history shall be a portion of the course, and that the time thus gained be devoted to the study of an abstract of the general history of the world.

In my communications with the Principal of the State Normal Schools, I have made some suggestions in regard to the water supply, the improvements in the school building, the library, and apparatus, which he will present to you.

It is believed that the liberal appropriations made by the last Legislature will entirely complete the building, and go far towards a full equipment of the school. We may anticipate, therefore, that during the coming year the Branch Normal School will reach a state of completeness that will render it entirely effective in accomplishing the purpose for which it was established. The Branch Normal School building has been found, in its general arrangements, to be admirably adapted to the purpose for which it was constructed. In the organization of the school, and its management, the faculty has copied closely the State Normal School at San José. The smoothness with which our school has opened and passed through its first year, is, no doubt, due, in a large degree, to the advantages which it has enjoyed from the experience of that school.

Very respectfully yours,

C. J. FLATT,
Vice-Principal Branch Normal School.

REPORTS

OF THE

SECRETARY AND PRINCIPALS,

For the Thirty-fifth Fiscal Year.

FINANCIAL REPORT

Of the California State Normal School, San José, for the Thirty-fifth Fiscal Year, ending June 30, 1884.

Date of Auditing.		Dr.	Cr.
1883.	Amount of appropriation for 35th fiscal year	\$40,000 00	
	Balance of tuition money on hand July 1, 1883.	154 07	
	Amount of tuition collected for term ending December 20, 1883	1,463 05	
	Amount of tuition collected for term ending May 22, 1884	1,544 25	
	Tuition money for 34th year collected after July 1, 1883	80 90	
	Amount received from sale of hay	30 00	
	Amount transferred from appropriation for improvement of grounds	12 16	
July 16	Amount paid Janitor and Curator, salaries for July, 1883		\$120 00
Aug. 16	Amount paid for salaries for July, 1883		2,645 82
Aug. 16	Amount paid gardeners, salaries one month, to August 8, 1883		110 00
Aug. 16	Amount paid V. Pachaud, plowing and repairing tools		54 75
Aug. 16	Amount paid for salaries for August, 1883		2,765 82
Aug. 16	Amount paid H. D. Noyes & Co., subscription to periodicals		46 20
Aug. 16	Amount paid E. H. Guppy, stationery		43 60
Aug. 16	Amount paid Farmers' Union, janitor tools and supplies		49 16
	Amount paid McNeil Brothers, binding and repairing books		19 50
Aug. 16	Amount paid J. W. Cook, toweling and cloth		13 00
Sept. 20	Amount paid for salaries for September, 1883		2,765 82
Sept. 20	Amount paid E. H. Guppy, stationery and pointers		47 33
Sept. 20	Amount paid Shaw & Callisch, chemicals		20 55
Sept. 20	Amount paid C. H. Allen, postage, express, etc		45 45
Sept. 20	Amount paid McNeil Brothers, printing circulars		2 50
Sept. 20	Amount paid W. H. McEwen, set of wall maps		15 00
Sept. 20	Amount paid Morgan Miles, blackboard erasers		25 00
Sept. 20	Amount paid L. Lion, linen and oilcloth		13 42
Sept. 20	Amount paid J. W. Cook, cloth for projecting screen		5 25
Sept. 20	Amount paid J. C. Corcoran, plumbing repairs		8 15
Sept. 20	Amount paid F. Schilling, keys		3 50
Sept. 20	Amount paid R. P. Munroe, janitor tools and supplies		15 00
Sept. 20	Amount paid John Rock, trees and plants		196 90
Sept. 20	Amount paid L. F. Sanderson, trees		9 00
Sept. 20	Amount paid A. S. Babcock, mower and tools		104 25
Sept. 20	Amount paid H. B. Alvord, tools, etc		17 36
Sept. 20	Amount paid David Walsh, shoeing and repairing tools		15 25
Sept. 20	Amount paid Geo. Greenman, hay		10 10
Sept. 20	Amount paid gardeners, salaries one month, to September 8, 1883		110 00
Oct. 19	Amount paid for salaries for October, 1883		2,765 82
Oct. 19	Amount paid Daunes & Van Doren, coal		720 76
Oct. 19	Amount paid E. H. Guppy, stationery		150 17
Oct. 19	Amount paid A. Waldteufel, kindergarten material		21 63
Oct. 19	Amount paid Herald Company, advertising for stationery		2 00
Oct. 19	Amount paid McNeil Brothers, binding and repairing books		13 50
Oct. 19	Amount paid gardeners, salaries one month, to October 8, 1883		110 00
Oct. 19	Amount paid Chas. A. Hagan, hose and attachments		86 76
Oct. 19	Amount paid Michael Donovan, earth for grounds		137 71
Nov. 15	Amount paid for salaries for November, 1883		3,015 81

FINANCIAL REPORT—Continued.

Date of Auditing.		Dr.	Cr.
1883.			
Nov. 15	Amount paid G. W. Tryon, Jr., two volumes conchology		\$15 00
Nov. 15	Amount paid B. J. Rhodes & Co., bottles for laboratory		9 75
Nov. 15	Amount paid gardeners, salaries one month, to November 8, 1883		110 00
Nov. 15	Amount paid Geo. Greenman, hay		6 68
Dec. 14	Amount paid for salaries for December, 1883		2,882 48
Dec. 14	Amount paid Geo. B. McKee & Co., slating		23 65
Dec. 14	Amount paid J. B. Jarman, putting on slating		10 50
Dec. 14	Amount paid E. H. Guppy, stationery		13 48
Dec. 14	Amount paid Daunes & Van Doren, coal		7 00
Dec. 14	Amount paid R. P. Munroe, janitor tools and supplies		15 65
Dec. 14	Amount paid Shaw & Callisch, chemicals		2 50
Dec. 14	Amount paid C. H. Allen, postage, express, and sundries		44 75
Dec. 14	Amount paid Mrs. A. E. Bush, expenses for museum		25 15
Dec. 14	Amount paid S. J. Foundry, work on furnace		193 05
Dec. 14	Amount paid J. L. Snow, material and masonwork on furnace		114 25
Dec. 14	Amount paid F. Kuchenbeiser, repairs on fence and furnace		150 64
Dec. 14	Amount paid gardeners, salaries one month, to December 8, 1883		110 00
Dec. 14	Amount paid J. Boschen, tools and hardware		15 05
Dec. 14	Amount paid P. Thiel, masonwork on furnace		32 50
Dec. 14	Amount paid Bank of San José, discount and exchange		23 22
Dec. 14	Amount paid S. C. V. M. & L. Co., lumber and labor		76 14
Dec. 14	Amount paid Henry Laurillard, tuning and repairing pianos		22 00
1884.			
Jan. 17	Amount paid for salaries for January, 1884		2,824 15
Jan. 17	Amount paid C. H. Allen, expenses graduating class, December, 1883		59 64
Jan. 17	Amount paid C. H. Allen, sundries, repairs furnaces		71 09
Jan. 17	Amount paid S. J. Gas Company, gas six months, to January 1, 1884		134 05
Jan. 17	Amount paid E. H. Guppy, stationery		65 98
Jan. 17	Amount paid Sunset Telephone-Telegraph Company, box rent six months		\$15 00
Jan. 17	Amount paid T. R. Morphy, carpenter repairs		35 00
Jan. 17	Amount paid Platt Gregory, covering erasers		34 00
Jan. 17	Amount paid Magazine American History, subscription for 1884		5 00
Jan. 17	Amount paid J. M. Sheehan, plumbing on furnaces and repairing		81 94
Jan. 17	Amount paid Daunes & Van Doren, lime and cement for chimneys, material and masonwork on chimneys		4 75
Jan. 17	Amount paid Wolcott & Wyatt, sewer and repairs		92 00
Jan. 17	Amount paid John Stock, stoves, pipe, zinc, labor, etc.		100 23
Jan. 17	Amount paid F. Schilling, repairing locks, keys, etc.		5 50
Jan. 17	Amount paid gardeners, salaries one mo. to Jan. 8, 1884		110 00
Jan. 17	Amount paid George Greenman, hay		10 10
Jan. 17	Amount paid Dingee & Conard Co., roses for grounds		10 00
Feb. 20	Amount paid for salaries for February, 1884		2,824 15
Feb. 20	Amount paid Daunes & Van Doren, coal		242 98
Feb. 20	Amount paid E. H. Guppy, stationery		92 32
Feb. 20	Amount paid sundry persons, janitor tools and supplies		40 00
Feb. 20	Amount paid Farmers' Union, hardware		5 85
Feb. 20	Amount paid J. C. Corcoran, plumbing repairs		60 53
Feb. 20	Amount paid A. L. Bancroft & Co., Rand & McNally's atlas		30 00
Feb. 20	Amount paid A. Waldteufel, Encyclopædia Brit., vol. 16		10 50
Feb. 20	Amount paid G. W. Tyron, Jr., conchology, volume 3		10 00
Feb. 20	Amount paid F. P. Montgomery, map holders and mounting		50 00
Feb. 20	Amount paid George Denne, programme board		5 00

FINANCIAL REPORT—Continued.

Date of Auditing.		Dr.	Cr.
1884.			
Feb. 20	Amount paid T. R. Morphy, labor and material for carpentering repairs		\$100 47
Feb. 20	Amount paid gardeners, salaries one mon. to Feb. 8, '84		110 00
Feb. 20	Amount paid David Walsh, horseshoeing and repairing tools		18 45
Feb. 20	Amount paid Farmers' Union, wheat and barley for seed		9 80
Mar. 20	Amount paid for salaries for March, 1884		2,824 15
Mar. 20	Amount paid gardeners, salaries one mon. to Mar. 8, '84		110 00
April 17	Amount paid for salaries for April, 1884		2,824 15
April 17	Amount paid gardeners, salaries one mon. to April 8, '84		110 00
April 17	Amount paid J. W. Queen & Co., apparatus and freight		315 49
April 17	Amount paid W. J. Wolcott, material and labor repairing furnace and flues		71 95
April 17	Amount paid John Stock Sons, stoves and pipe		35 15
April 17	Amount paid C. Sproat, repairs to electric system		13 15
April 17	Amount paid T. R. Morphy, labor and material for carpentering repairs		16 35
April 17	Amount paid McNeil Bros., bookbinding and stationery		39 25
April 17	Amount paid J. H. Elwood, music chart		10 00
April 17	Amount paid B. J. Rhodes, acid for janitor and laboratory		3 60
April 17	Amount paid John Rock, trees for grounds		59 70
April 17	Amount paid Victor Pachaud, plowing and harrowing		28 00
May 15	Amount paid for salaries for May, 1884		2,824 15
May 15	Amount paid gardeners, salaries two mon. to June 8, '84		220 00
May 15	Amount paid Daunes & Van Doren, coal		227 94
May 15	Amount paid E. H. Guppy, stationery and dictionary		74 11
May 15	Amount paid McNeil Bros., bookbinding		11 50
May 15	Amount paid B. J. Rhodes, chemicals		12 80
May 15	Amount paid C. H. Allen, payroll, labor on grounds		222 00
May 15	Amount paid Henry B. Alvord, tools		13 25
May 15	Amount paid J. Boschen, tools		15 60
June 5	Amount paid for salaries for June, 1884		3,336 15
June 5	Amount paid gardeners, salaries one mon. to July 8, '84		110 00
June 5	Amount paid C. H. Allen, commencement expenses		59 75
June 5	Amount paid H. W. Arthur Nahl, diplomas		92 00
June 5	Amount paid A. L. Bancroft & Co., seven volumes Bancroft's History		38 50
June 5	Amount paid C. H. Allen, postage, express, freight, etc.		100 65
June 5	Amount paid J. M. Sheehan, plumbing repairs and gas stove		25 00
June 5	Amount paid J. C. Coreoran, plumbing repairs		7 35
June 5	Amount paid F. Kuchenbeiser, repairs on furnace		20 52
June 5	Amount paid H. Laurilliard, tuning and repair'g pianos		11 75
June 5	Amount paid R. P. Munroe, janitor tools and supplies		11 15
June 5	Amount paid Shaw & Callisch, carbolic powder		2 00
June 5	Amount paid C. H. Allen, payroll, labor on grounds		59 00
June 5	Amount paid R. Ulrich, services laying out grounds		25 00
June 5	Amount paid sundry persons, twenty per cent deducted from salaries		65 00
June 5	Amount paid David Walsh, repairing tools		8 75
June 5	Amount paid Mercury and Herald, advertising		2 50
June 5	Amount paid Gens Nissen, freight and cartage on plants		40 00
June 5	Amount paid A. Parkhurst, mounting bird for museum		10 00
June 5	Amount paid John Stock Sons, smokestack		36 90
June 5	Amount paid Charles A. Hagan, sprinklers		10 00
July 15	Amount paid Sunset Telephone-Telegraph Company, box rent six months		15 00
July 15	Amount paid San José Gas Company, gas six months, to June 30, 1884		82 25
Aug. 5	Amount paid for express on money		14 55
Aug. 21	Amount paid for express on money and exchange		15 42
	Balance on hand		1,509 14
	Totals	\$43,284 43	\$43,284 43

SUMMARY OF ABOVE ACCOUNT.

	Dr.	Cr.
Total income for 35th fiscal year	\$43,284 43	
Amount paid for salaries of Faculty and Janitor		\$34,483 47
Amount paid for apparatus		315 49
Amount paid for stationery		508 34
Amount paid for books and periodicals		189 20
Amount paid for binding books		47 50
Amount paid for repairs to heating apparatus and sewer		761 59
Amount paid for stoves		135 38
Amount paid for fuel		1,198 68
Amount paid for janitor tools and supplies		132 96
Amount paid for postage, express, freight, etc.		190 85
Amount paid for lumber and sundry carpentering repairs		227 96
Amount paid for map holders, erasers, and sundry school supplies		189 98
Amount paid for toweling and cloth		31 67
Amount paid for chemicals		39 45
Amount paid for museum expenses		35 15
Amount paid for plumbing repairs		101 03
Amount paid for repairs to piano, battery, locks, etc.		55 90
Amount paid for graduating expenses and diplomas		211 39
Amount paid for gas		216 30
Amount paid for telegraph box rent		30 00
Amount paid for discount, exchange, and expressage on money		53 19
<i>Cost of Maintaining Grounds.</i>		
Amount paid for salaries of gardeners	\$1,320 00	
Amount paid for trees, plants, and seeds	325 40	
Amount paid for hardware, tools, and repairing tools	285 56	
Amount paid for hose	86 76	
Amount paid for repairs to fence and engine smokestack	108 00	
Amount paid for labor on grounds	329 50	
Amount paid for earth for grounds	137 71	
Amount paid for hay	26 88	
		2,619 81
Balance of appropriation		366 40
Balance of tuition		1,142 74
Total	\$43,284 43	\$43,284 43

FINANCIAL REPORT

Of the Branch State Normal School, Los Angeles, for the Thirty-fifth Fiscal Year, ending June 30, 1884.

Date of Auditing.		Dr.	Cr.
1883.	Amount of appropriation for 35th fiscal year	\$15,000 00	
	Amount received by Ira More for rent of rooms, sale of stable, and sundries	394 95	
Aug. 16	Amount paid for salaries for July, 1883		\$841 67
Aug. 16	Amount paid for salaries for August, 1883		891 67
Aug. 16	Amount paid Phil. Hirschfeld, books and stationery		97 08
Aug. 16	Amount paid C. E. Taylor, janitor supplies		20 55
Aug. 16	Amount paid A. H. Andrews & Co., programme clock		19 25
Aug. 16	Amount paid M. L. Wicks, set of apparatus		70 00
Sept. 3	Amount paid A. K. Clark, rent of piano		15 00
Sept. 3	Amount paid Ira More, postage and express		15 65
Sept. 20	Amount paid for salaries for September, 1883		891 67
Sept. 20	Amount paid Los Angeles Water Co., water for August		50 00
Sept. 20	Amount paid Thomas Clancey, irrigating trees		12 80
Oct. 19	Amount paid for salaries for October, 1883		891 67
Oct. 19	Amount paid E. S. Ritchie & Sons, apparatus		144 87
Oct. 19	Amount paid Thomas Clancey, irrigating		24 00
Oct. 19	Amount paid Dotter, Bradley & Co., furniture		58 50
Oct. 19	Amount paid Los Angeles Water Co., water for Septemb'r.		50 00
Oct. 19	Amount paid C. J. Glover, freight and cartage		14 44
Oct. 19	Amount paid M. S. Baker, repairing faucets		3 00
Oct. 19	Amount paid Hellman, Stassforth & Co., gazetteers		21 60
Oct. 19	Amount paid California Electric Works, batteries		13 55
Oct. 19	Amount paid Los Angeles Times, advertising		1 60
Nov. 15	Amount paid for salaries for November, 1883		891 67
Nov. 15	Amount paid M. W. Childs, stoves, pipe, etc.		86 20
Nov. 15	Amount paid Los Angeles Water Co., water for October		50 00
Nov. 15	Amount paid Preuss & Pironi, chemicals and laboratory fittings		36 61
Nov. 15	Amount paid A. K. Clark, rent of piano		10 00
Nov. 15	Amount paid Ira More, express and cartage on apparatus		11 42
Dec. 13	Amount paid for salaries for December, 1883		891 67
Dec. 13	Amount paid Dotter & Bradley, matting for library		73 93
Dec. 13	Amount paid L. Mesmer, desk for preceptress' room		67 00
Dec. 13	Amount paid Los Angeles Water Co., water for Nov'mbr.		36 67
Dec. 13	Amount paid M. W. Childs, material and labor, plumbing		24 45
Dec. 19	Amount paid Phil. Hirschfeld, books, maps, and stationery		108 23
Dec. 19	Amount paid A. K. Clark, rent of piano		25 00
Dec. 19	Amount paid L. A. Water Company, water for December		10 00
Dec. 19	Amount paid City of L. A., water from November 20 to January 1		13 33
1884.			
Jan. 17	Amount paid for salaries for January, 1884		941 67
Jan. 17	Amount paid L. A. Water Company, water for July, 1883		50 00
Jan. 17	Amount paid Walter S. Maxwell, coal		87 17
Jan. 17	Amount paid Ira More, railroad fare attending Board meeting		39 00
Jan. 17	Amount paid B. F. Conlter, pumping water for N. School		20 00
Jan. 17	Amount paid M. W. Childs, hose for irrigating		27 00
Feb. 20	Amount paid for salaries for February, 1884		991 67
Feb. 20	Amount paid L. T. Valentine, piano		400 00
Feb. 20	Amount paid W. C. Furrey, hardware and janitor supplies		40 65
Feb. 20	Amount paid Ira More, postage, express, and freight		38 10
Feb. 20	Amount paid Barker & Allen, tables		21 00
Feb. 20	Amount paid L. A. Water Company, water for January		10 00
Mar. 20	Amount paid for salaries for March, 1884		966 67

FINANCIAL REPORT—Continued.

Date of Auditing.		Dr.	Cr.
Apr. 17...	Amount paid for salaries for April, 1884	-----	\$966 67
Apr. 17...	Amount paid Phil. Hirschfeld & Co., books	-----	199 00
Apr. 17...	Amount paid W. C. Furrey, relining tank	-----	186 04
Apr. 17...	Amount paid W. C. Furrey, tools	-----	21 50
Apr. 17...	Amount paid L. A. Water Company, water for February	-----	30 00
Apr. 17...	Amount paid L. A. Water Company, water for March	-----	50 00
Apr. 17...	Amount paid H. C. Gephart, covering swing doors	-----	13 00
Apr. 17...	Amount paid Platte Bros., hauling manure	-----	12 25
May 15...	Amount paid for salaries for May, 1884	-----	966 67
May 15...	Amount paid L. A. Water Company, water for April	-----	50 00
May 15...	Amount paid Holmes & Scott, coal	-----	32 00
May 15...	Amount paid Phil. Hirschfeld, books	-----	103 10
May 15...	Amount paid J. S. Cutler, cyclopedia	-----	15 00
May 15...	Amount paid Meyberg Bros., lamps	-----	13 20
June 5...	Amount paid for salaries for June, 1884	-----	941 67
June 5...	Amount paid W. C. Furrey, sewer, tools, and repairing	-----	183 50
June 5...	Amount paid M. W. Childs, fire hose	-----	97 50
June 5...	Amount paid E. F. Taylor, flagstaff	-----	24 25
June 5...	Amount paid Ira More, paid for carpenter work	-----	14 00
June 5...	Amount paid Preuss & Pironi, chemicals	-----	8 15
July 15...	Amount paid L. A. Water Company, water for May	-----	19 00
July 15...	Amount paid L. A. Water Company, water for June	-----	10 00
July 15...	Amount paid W. C. Furrey, flag	-----	30 00
July 15...	Amount paid Brown & Mathews, agricultural imple- ments	-----	28 50
July 15...	Amount paid Mirror Printing House, programmes	-----	10 50
	Amount paid by Ira More for improvement of grounds and petty cash account	-----	354 20
	Balance of appropriation July 1, 1884	-----	856 82
	Balance in hands of Ira More	-----	40 75
		\$15,394 95	\$15,394 95

SUMMARY OF ABOVE ACCOUNT.

	Dr.	Cr.
Amount of appropriation, 35th fiscal year	\$15,000 00	
Amount received by Ira More for rent and sundries	394 95	
Amount paid for salaries		\$11,075 04
Amount paid for books and stationery		544 01
Amount paid for furniture and apparatus		967 50
Amount paid for tools, repairs, and building sewer		263 50
Amount paid for plumbing		210 49
Amount paid for water		449 00
Amount paid for hose		124 50
Amount paid for fuel		119 17
Amount paid for postage, express, and freight		79 61
Amount paid for janitor supplies and hardware		61 20
Amount paid for piano rent		50 00
Amount paid for chemicals and laboratory fixtures		44 76
Amount paid for flagstaff and flag		54 25
Amount paid Ira Moore for traveling expenses		39 00
Amount paid for printing		12 10
Amount paid for improvement of grounds and petty cash account		403 25
Balance of appropriation		856 82
Balance in hands of Ira More		40 75
	\$15,394 95	\$15,394 95

REPORT OF RECEIPTS AND EXPENDITURES

For Completion of Branch Normal School Building, Los Angeles.

Date of Auditing.		Dr.	Cr.
1882.			
Dec. 21	Balance on hand per report made June 30, 1882	\$76 12	
	Amount paid for grading and digging sewer		\$76 12
1883.			
July 2	Amount of appropriation for completing building	10,000 00	
July 2	Amount paid I. W. Hellman, money advanced Sept., 1882, to complete building		1,000 00
July 2	Amount paid Los Angeles City Board of Education, rent paid in advance and refunded		1,000 00
Aug. 4	Amount paid City of Los Angeles, assessment on sewer		115 50
Aug. 4	Amount paid Perry, Mott & Co., doors and sash		41 80
Aug. 4	Amount paid M. W. Childs, water pipe		363 82
Aug. 4	Amount paid Samuel Holyland, lathing		32 50
Aug. 4	Amount paid J. M. Griffith & Co., lumber		682 25
Aug. 4	Amount paid A. Flood, artificial stone floor		226 24
Aug. 4	Amount paid Thos. Stovell, mill work		10 20
Aug. 4	Amount paid Marble Lime Co., lime		48 87
Aug. 4	Amount paid Michael Phelan, sand for plastering		15 00
Aug. 4	Amount paid W. C. Furrey, hardware		135 15
Aug. 4	Amount paid C. H. Allen, payroll for July		2,408 00
Aug. 4	Amount paid Schofield & Tevis, paints, oil, and varnish		480 90
Aug. 4	Amount paid Harper, Reynolds & Co., hardware		4 50
Aug. 4	Amount paid D. McCarty, sewer pipe and laying		70 00
Aug. 4	Amount paid L. A. Water Co., connecting pipes		185 25
Aug. 4	Amount paid Wm. McLean, plastering		47 00
Aug. 4	Amount paid Fred. Eaton, completing water system		341 93
Aug. 4	Amount paid Manning & Offut, lettering doors		10 00
Aug. 4	Amount paid C. H. Allen, petty bills		20 40
Aug. 4	Amount paid Brown & Matthews, glass and hardware		187 80
Aug. 6	Amount paid S. H. Kent, services as arbiter on claim of T. J. Gillespie		35 00
Aug. 6	Amount paid T. J. Gillespie, balance on contract for inside finish		365 00
Sept. 3	Amount paid Ira More, payroll for August		476 25
Sept. 3	Amount paid Dotter & Bradley, furniture		64 50
Sept. 3	Amount paid Schofield & Tevis, paints, etc.		39 25
Sept. 3	Amount paid T. J. Coughlin, graining cases		20 00
Sept. 3	Amount paid M. W. Childs, hardware		9 25
Sept. 20	Amount paid Ira Moore, payroll, plastering third story		276 80
Sept. 20	Amount paid Ira More, September payroll for painting		126 20
Sept. 20	Amount paid Ira More, September payroll, carpenters and laborers		89 60
Sept. 20	Amount paid Brown & Matthews, glass and repairs		2 60
Sept. 20	Amount paid F. Field, plaster brackets		34 20
Oct. 19	Amount paid J. C. McMenomy, plumbing		85 20
Oct. 19	Amount paid Gilbert & Moore, locks, knobs, and cloth		40 00
Oct. 19	Amount paid Marble Lime Co., lime		4 00
Oct. 19	Amount paid Buhr & Fisher, tables		98 00
Oct. 19	Amount paid C. H. Allen, services as executive agent in completing building		500 00
Nov. 15	Amount paid W. H. Perry, M. & L. Co., plaster and hair		34 75
Nov. 15	Amount paid M. W. Childs, material and labor for service pipe		54 60
Nov. 15	Amount paid Fred. Eaton, change of water pipe connection		22 60
Nov. 15	Amount paid Thos. Copley, material and labor grading street		85 50
Nov. 15	Amount paid T. J. Anderson, carpenter work		22 00
1884.			
Feb. 20	Amount paid W. C. Furrey, hardware		25 85
	Balance on hand July 1, 1884		61 74
	Totals	\$10,076 12	\$10,076 12

REPORT OF EXPENDITURES

From Appropriation for Improvement of Grounds, Branch Normal School.

Date of Auditing.		Dr.	Cr.
1883.			
	Amount of appropriation.....	\$1,000 00	
Aug. 4---	Amount paid City of Los Angeles, assessment grading street.....		\$285 00
Aug. 4---	Amount paid C. H. Allen, payroll to July 14, 1883.....		34 50
Aug. 4---	Amount paid Ira More, payroll to July 31, 1883.....		124 70
Aug. 4---	Amount paid J. M. Griffith & Co., lumber for fence.....		27 44
Aug. 4---	Amount paid W. C. Furrey, tools, nails, etc.....		17 25
Aug. 4---	Amount paid J. V. York, plowing.....		25 00
Sept. 3---	Amount paid Ira More, payroll to August 25, 1883.....		343 20
Sept. 20---	Amount paid Ira More, payroll to September 12, 1883.....		32 00
1884.			
Jan. 17---	Amount paid J. Mitschler, work on grounds.....		11 00
Jan. 17---	Amount paid Jas. McLaughlin, hauling sand and gravel.....		62 40
	Balance on hand July 1, 1884.....		37 51
	Totals	\$1,000 00	\$1,000 00

CHAS. H. ALLEN,
Secretary Board of Trustees.

SAN JOSÉ, June 30, 1884.

REPORT OF PRINCIPAL OF NORMAL SCHOOL AT SAN JOSE.

To the Board of Trustees of the California State Normal School:

GENTLEMEN: I have the honor of submitting the following report of the Normal School in San José under your charge, for the school year ending May 22, 1884:

STATISTICAL.

During the year we have examined for admission two hundred and fifty-four pupils. These applied for and were admitted to classes as follows:

Applied for Senior Class.....	23	Admitted to Senior Class.....	2
Applied for Second Term, Middle Class.....	23	Admitted to Second Term, Middle Class.....	17
Applied for First Term, Middle Class.....	71	Admitted to First Term, Middle Class.....	28
Applied for Second Term, Junior Class.....	68	Admitted to Second Term, Junior Class.....	70
Applied for First Term, Junior Class.....	69	Admitted to First Term, Junior Class.....	87
Total number examined.....	254	Total number admitted.....	204

Rejected, or assigned to Preparatory Class, 50.

Graduates of high schools admitted, 21.

Graduates of other institutions, 4.

Many of those admitted to Junior Classes were pupils who had applied for admission to advanced classes. The new pupils examined represent thirty-nine counties of this State, six other States, and one Territory.

Forty-five counties have had representatives in the school during the past year, distributed as follows:

Alameda.....	37	Sacramento.....	13
Amador.....	8	San Benito.....	9
Butte.....	15	San Bernardino.....	1
Calaveras.....	5	San Diego.....	9
Colusa.....	7	San Francisco.....	30
Contra Costa.....	22	San Joaquin.....	22
Fresno.....	8	San Luis Obispo.....	1
Humboldt.....	23	San Mateo.....	6
Inyo.....	1	Santa Barbara.....	1
Kern.....	6	Santa Clara.....	235
Lake.....	2	Santa Cruz.....	31
Lassen.....	2	Shasta.....	4
Marin.....	11	Sierra.....	7
Mariposa.....	1	Solano.....	7
Mendocino.....	6	Sonoma.....	13
Merced.....	1	Stanislaus.....	5
Modoc.....	2	Sutter.....	6
Mono.....	3	Trinity.....	4
Monterey.....	7	Tulare.....	4
Napa.....	5	Tuolumne.....	4
Nevada.....	15	Yolo.....	13
Placer.....	9	Yuba.....	7
Plumas.....	2		

Besides these, there have been representatives from six other States and three Territories.

Of the counties not represented, two are in the southern part of the State, which is provided with a Normal School, and the others are remote.

The highest enrollment during the year was 501, in August; average enrollment, 478; average daily attendance, 470; average percentage of attendance, 98.3; average percentage of punctuality, 99.2.

The above statistical report is, in many respects, instructive. It has again been alleged, upon the floor of the Legislature, that the Normal School is a High School for Santa Clara County; that seventy-five per cent of its pupils are from San José, or Santa Clara County; and that many enter the school who never expect to engage in teaching.

The figures above, taken accurately from the records of the school, show that only thirty-six per cent of all its pupils are from Santa Clara County. Of the two hundred and thirty-five enrolled from this county, not less than ten per cent are from families who have selected San José for a residence, solely to enjoy the benefits of the Normal School. This, with the additional fact that the county is one of the most populous in the State, is not a disproportionate number. It is always found that the patronage of a school is largely drawn from its immediate vicinity.

In answer to the second charge, the report of the State Superintendent of Public Instruction and records in this office show that about sixty per cent of all the graduates of the school since its beginning in 1862, taught in this State last year. It is greatly to be doubted whether any other school in the country can show so good a record. From the class of 1882, numbering seventy-five, *seventy-one* had taught in the public schools of the State within one year of graduation. From the class of May, 1883, numbering eighty-five, seventy-eight have taught; and many of the class of December, 1883, have already obtained positions.

In addition to the class of fifty graduated in December last, we present now a class of thirty-eight, who have completed the course of study, training, and practice which has been prescribed. We are confident that the demand for trained teachers will soon enable all these to find desirable places in the schools of the State.

GENERAL.

During the year the work of the school has gone on quietly, and we believe satisfactorily. The changes in the Faculty, consequent upon the election of Professor Ira More to the Principalship of the Branch Normal School, and resignation of Professor J. H. Braly, who left to enter upon other duties, created the usual amount of friction, and yet, by your wise action in filling the places made vacant, and the cheerfulness with which all have been willing to take upon themselves the new duties assigned them, the efficiency of our work has not been materially impaired. Both these gentlemen had been long connected with the school, and have filled well, important positions. They took with them the good wishes, not only of the Board of Trustees, but of all the Faculty and students.

In Professor A. H. Randall, the gentleman appointed to fill the vacancy created by the promotion of Professor Norton to the Vice-Principalship, the school has secured a most careful and painstaking

teacher, and one who brings a large experience and broad culture to his work.

I have no recommendations to make in reference to changes in the Faculty, believing that, as now constituted, we can work harmoniously, and that the work will be well done in all the departments of the school.

While the work we are doing is, in many things, entirely acceptable, there are some difficulties that press upon us more and more strongly. They are those found, I believe, in most Normal Schools. The most difficult problem is, and for years must be, that of taking the pupils where the grammar schools send them to us, and, in the time allotted, giving them back to the State with that knowledge, training, and culture which the State demands, and should have in its teachers. The knowledge required by the teacher is so different, both in quantity and quality, from that required by a mere student, that this difficulty can be fully appreciated only by those who work in this department of the educational field. To the solution of this problem, we have given our best endeavors; but I greatly fear that in trying to secure the desired end we have, in many cases, overworked our pupils. The Faculty are of the unanimous opinion that some relief from this pressure should be obtained, and they are also desirous that an additional amount of time should be given to professional work.

The only relief that I can suggest must come from one of three sources: To raise the grade of admission; to diminish the course of study; or to adjust the work in the school, so as to give more time for regular and systematic outdoor exercise, and to insist upon its being taken. Under the first, we recommend that the Board adopt a rule that no pupil be admitted to the examinations for admission who has not graduated in the grammar school course, as established in most of the counties, or made in his studies an equivalent advancement, where no provisions are made for such graduation. This will practically raise the grade of admission; for, although we have for two years tried to adhere to this, many have barely passed the entrance examination and been admitted, with not strength enough to go through with the work. We believe that this rule, and the readjustment of studies, suggested in another place, will gain us the time of one study through the entire course.

The matter of dropping certain subjects from the curriculum has received the careful attention of the Faculty. At a meeting held while Superintendent Welcker was favoring us with a visit of inspection, and at which he was present, it was resolved to drop some two or three studies now in the course, and to diminish the time given to certain other studies. Since then the matter has been referred to a committee, who have bestowed much time upon its consideration, and they report in favor of a somewhat different way of reaching the same end. This report has since been unanimously adopted by the Faculty.

Their recommendation is, that the curriculum be left, so far as studies are concerned, essentially unchanged, at least for the coming year. The time devoted to some of the studies is lessened, and all pupils are given one study hour, under supervision, during each day's session.

This will secure the two ends sought, namely: to relieve pupils somewhat from the great pressure of work, which they have so seriously

felt, and to give more time to professional studies, and to observation and practice in the training department.

In this we have reached conclusions almost identical with those reached by the Faculty of the Branch Normal School, to whom the same matter was referred.

PROFESSIONAL WORK.

It has been remarked in a meeting of this Board, that if anything justifies the existence of Normal Schools, it is the work they do in giving professional training. At the last meeting of the Board the question was raised whether, in this school, we were sufficiently emphasizing this work. I desire, in this part of my report, to show, not that we are doing too much, for that could hardly be possible, but that it is receiving a large share of our care and attention, and that in amount it far exceeds that given in most Normal Schools.

The professional training may be briefly summed up as follows:

1. From the time the pupil enters the lowest Junior Class until he graduates, his attention is constantly kept fixed upon the fact that he is learning each subject with a view of imparting it to others, and the method of presentation is made a subject of continued observation. As with few exceptions all the Faculty are graduates of Normal Schools, and even in the exceptional cases, they are teachers of wide and varied experience, the pupil is, from the beginning, being trained to teach. This continued for three years is, in itself, an amount of training which must be of great value. The philosophy of the work he has not yet culture enough to appreciate, or even understand.

2. During his course, as he advances to riper scholarship, and a greater capacity for grasping the subject, he receives about one hundred and twenty lectures, beginning with an outline of mental philosophy, upon "methods of teaching, grading, and disciplining a school." These lectures cover not only the philosophy of education, but practical and detailed instruction in the minutiae of teaching. Of these lectures he is required to take copious notes, and to rewrite them for future reference. He also takes, during the Senior year, the same number of review lessons upon the subjects taught in the grammar schools, and these are a *practical* presentation of methods of teaching. These reviews are given, mainly, without text-books, the pupil taking notes, thus carrying away a voluminous note book of original work, designed to be fitted for his own classes, when he becomes a teacher.

3. He is required to practice in the training department until he convinces the critic teachers that he has at least a fair ability in teaching. During this teaching he attends four days a week, a critique upon his own work and the work of his fellow teachers, conducted by the critic teachers, and these sessions, being from one and a half to two hours each, constitute a continued and searching review of his theoretical ideas, as derived from lectures. He also spends some time in observation, during which he is expected to take part in the criticism, thus enabling him to judge of his own work and that of others. This is the regular work in the school, and while I should be exceedingly glad if more time could be given to practice teaching, I feel that if we can increase the time for observation, it will be all, as the school is now organized, that we can do.

The last three classes have each subscribed for and read, with more or less care, a leading educational journal; and all are urged to con-

tinue this, and to purchase and study, after they leave school, standard educational works.

If it be asked why, after so much professional work, the teachers sent out are not all entirely successful, the answer must be found in the fact that this is a result parallel to that reached by all other professional schools. Of the graduates from law, medical, or theological schools, some fail, many achieve mediocrity, and a few take high rank in their profession. It is not strange, then, that of those preparing for the profession of teaching, a profession requiring more varied acquirements, and greater versatility of thought, some fail in taking that rank which we would desire for them. As a general proposition, our teachers *are* successful. They are constantly in demand, and of marked failures we very rarely hear. If but few reach the higher ranks of the profession, it may be explained by the fact that the opportunities for such advancement are few, and that the great body of graduates have not yet been long in the field.

With thanks to the members of the Faculty for their faithful labors, and to you, gentlemen of the Board, for your cordial support, I subscribe myself, very respectfully,

Your obedient servant,

CHAS. H. ALLEN, Principal.

REPORT OF PRINCIPAL OF THE BRANCH NORMAL SCHOOL LOS ANGELES.

To the Board of Trustees of the California State Normal Schools:

GENTLEMEN: I beg leave to submit the following report of the Branch Normal School, at Los Angeles, for the school year ending May 29, 1884:

At the beginning of the school year in August last, a class of forty was admitted, there being sixty-one applicants. The rule made by you requiring admissions to be at the beginning of the term only, was not strictly enforced, not having been fully advertised. A class of thirty-two was admitted at the opening of the second term, January 15, 1884. The restriction of admissions to the commencement of the term seems to increase the regularity of attendance, lifts a burden of extra work from the teachers, and improves the scholarship of the lower classes. For the first year or two in the life of a Normal School its aim and objects are not well understood, and not a few apply and are admitted who have no special fitness for the teacher's work. The severity of the work and the earnestness required soon leave these by the wayside, but their places are filled by those better adapted to the requirements. While our numbers have been increasing, the quality of the material has been growing better from the first.

As was to be expected, a much larger number of students come from this county than from any other in the State; but the school has already passed out of the local stage, seventeen counties of the State being represented, as well as several Territories, and States beside our own.

The building is on one of the healthiest sites in the city, and its sanitary arrangement, since its completion last year, and connection with the city drainage, leave nothing to be desired. A portion of the time water can be had only in the basement story and on the first floor above, subjecting us to some inconvenience, and the building to danger of destruction in case of fire, but in nowise affecting the conditions of health for the students.

The portion of the public schools assigned to us by the City Board for use as a Training School has served the purpose well. The teachers, Misses Knapp, Desmond, and Murdoch, are to be commended for zeal and efficiency, both in teaching, and superintending the practice work of the Senior Class.

The little money that could be spared for the purpose has been used in grading the necessary approaches to the building, and in the care of the orange and other trees upon the grounds. It is to be hoped that at no distant day the Legislature will appropriate a sum sufficient to finish the grading, to build a bank wall at the cutting on Charity Street, and to put a substantial fence around the premises.

We present for graduation a class of twenty-two, the first fruits of our work here. As is usual with a new school, this class is of material much better than the average, and though wanting some of the

advantages in school appliances and surroundings which later classes enjoy, we feel confident you will find them unusually well fitted for their chosen vocation. Some have already engaged their schools for the coming year, and the indications are that the class will be fully provided for in this section of the State.

With many thanks to you, gentlemen, for your cordial support, as well as to my co-workers, who have exerted themselves for unifying and building up the school, I remain, very respectfully, yours,

IRA MORE, Principal.

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SIXTEENTH REPORT

OF THE

BOARD OF DIRECTORS AND OFFICERS

Of the California Institution for the Education of the

DEAF AND DUMB, AND THE BLIND,

FOR THE

Twenty-four Months ending June 30, 1884.



SACRAMENTO:

STATE OFFICE, JAMES J. AYERS, SUPT. STATE PRINTING.

1884.

BOARD OF DIRECTORS.

A. K. P. HARMON, President.....	Oakland
E. H. WOOLSEY, Vice-President.....	Oakland
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OFFICERS OF THE INSTITUTION.

PRINCIPAL,

WARRING WILKINSON, M.A.

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THEOPHILUS D'ESTRELLA.

TEACHERS OF THE BLIND,

CHARLES T. WILKINSON,	Mrs. A. R. GOODALL.
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TEACHER OF MUSIC,

GEO. B. GOODALL, M.A.

Dr. A. BARKAN.....	Expert Oculist and Aurist
Dr. H. T. LEGLER.....	Physician
W. E. ZANDER.....	Clerk

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E. P. PIKE.....	Foreman Carpenter Shop
S. E. WATSON.....	Foreman Printing Office
FRED. HANSEN.....	Engineer

REPORT.

OFFICE OF THE CALIFORNIA INSTITUTION FOR THE
EDUCATION OF THE DEAF AND DUMB, AND THE BLIND, }
BERKELEY, November 7, 1884. }

To his Excellency GEORGE STONEMAN, Governor:

SIR: The Directors of the Institution for the Deaf and Dumb, and the Blind, to whom by law is intrusted the management of this interesting department of public instruction, herewith respectfully submit their report for the two fiscal years ending June 30, 1884.

By reference to the report of the Principal, it will be seen that there have been under instruction one hundred and seventy-five pupils during the period referred to. This shows a yearly increase of about five per centum, which is about the ratio of increase for a long series of years.

The health of the pupils has been good, a fact due to the excellent sanitary construction of the buildings, and the ceaseless care of the officers in immediate charge.

The Treasurer's statement shows a satisfactory condition of financial matters. The actual current receipts and expenditures have been as follows:

RECEIPTS.

From State appropriation, fiscal year ending June 30, 1883.....	\$40,000 00
From State appropriation, fiscal year ending June 30, 1884.....	43,999 70
Principal.....	3,036 05
Total receipts.....	<u>\$87,035 75</u>

DISBURSEMENTS.

Current expenses, as per Treasurer's statement, and Principal's dissections.....	\$83,576 18
Salary of Secretary and Treasurer.....	1,000 00
Total disbursements.....	<u>\$84,576 18</u>

A statement of the invested funds of the institution will also be found in the Treasurer's report. It shows that the "Durham" and the "Strauss" funds are slightly increased over the original sums received. The benefit to the institution and its pupils from the interest of these funds has been very great.

The department of oral instruction has received during the past two years that attention which its importance deserves. The Board is of the opinion that such pupils as show aptitude for speech, especially those who have once had the advantage of hearing, should have training in articulation and lip reading, and to this end the Board desires to enlarge the teaching force in this direction as fast as means will allow.

The earnest wish and intention of the Board to reopen the mechanical department has been carried out during the last year. A carpenter shop and printing office have been started with the limited appropriation made by the last Legislature, and the progress already made by the pupils in these handicrafts is most commendable. The Board invites the special attention of your Excellency and the coming Legislature to this interesting feature of the institution's work.

The new bakery and cooking school for girls will be completed about the first of January, when another important addition will be made to the equipment of the school.

The needs of the institution for its support and development, as set forth in the Principal's report, are an abundant water supply, a new barn and cow shed, improvement of the grounds, a coal house, fitting up a gymnasium, and illustrative school apparatus. These are all important and essential improvements, for which the Board asks the favorable consideration of your Excellency and the coming Legislature.

The Board would also call your Excellency's attention to the report of State Engineer Hall, made two years ago, concerning a sewerage system for the benefit of this institution and the University of California. It is sincerely hoped that some provision will be made whereby the waste may be safely disposed of and an additional safeguard to the health of the children be secured.

The Directors take this occasion to bear testimony to the faithfulness and zeal of the officers in charge of the internal affairs of the institution. They have every reason to believe that in plan of construction and organization, in efficiency of its officers, and in results of instruction, the California school for the deaf and dumb and the blind ranks favorably with the best schools of the country. This belief is the result of personal observation on the part of some of the Directors and the testimony of visitors from abroad. It is referred to in no spirit of self laudation, but of thankfulness for the liberality of California in fostering this great beneficence.

Respectfully submitted.

A. K. P. HARMON,
President.

REPORT OF THE PRINCIPAL.

To the Board of Directors of the California Institution for the Deaf and Dumb, and the Blind:

GENTLEMEN: I herewith submit my report for the twenty-four months, ending June 30, 1884, the same being for the twenty-third and twenty-fourth years of the existence of the California Institution for the Education of the Deaf and Dumb, and the Blind:

NUMBER OF PUPILS.

Since the last biennial report the movement of pupils has been as follows:

On the rolls June 30, 1882:

DEAF AND DUMB.		
Boys	89	
Girls	43	
	112	
BLIND.		
Boys	10	
Girls	14	
	24	
Total both classes		136

The admissions since same date have been:

DEAF AND DUMB.		
Boys	16	
Girls	11	
	27	
BLIND.		
Boys	9	
Girls	3	
	12	
Total admissions		39
Total under instruction		175

There have been graduated and discharged:

DEAF AND DUMB.		
Boys	9	
Girls	4	
	13	
Died	1	
	14	
BLIND.		
Boys	3	
Girls	6	
	9	
Total deductions		23
On rolls June 30, 1884		152
Admitted since opening of term		14
On rolls October 1, 1884		166

HEALTH.

During the two years covered by this report the health of the pupils has been excellent, as a rule. No epidemic of any kind has found lodgment within the institution. Some sporadic cases of diphtheria have occurred, but all have yielded to the prompt remedies used, and the faithful care of physician and matrons. A few days before the close of school, Dolores Olivas, a resident of Santa Barbara, died of consumption. It was a case of hereditary predisposition, which no skill or watchfulness could overcome. The disease did its fatal work slowly and painlessly during a period of nearly four years, and the final dissolution was a gentle and welcome release.

THE SCHOOLS.

The progress of the pupils has been satisfactory. The teachers have been zealous and painstaking—the pupils have been diligent and docile. Our classes are too large, and the grading necessarily imperfect; but this is inevitable with a small number of pupils and a limited number of teachers. With every year's increase we shall come nearer to perfect gradation, and consequently do more efficient work with less exhausting labor on the part of the teachers. The two annual examinations have been searching and severe. It is intended that the standard of questioning shall be as near as possible that of the best city schools of equal grade, making no allowance for the fearful obstacles of deafness and blindness. This obstacle we mean to be overcome by the zeal and industry of pupil and teacher. That we come short of our ideal in individual cases must be admitted, but we are led to believe that the average attainments of the pupils of this institution will compare favorably with those of pupils educated in common schools throughout the State.

The course of study and the methods employed have not been materially changed during the last two years. The equipment of the schools has been improved by the purchase of a full set of Leuterman's Charts, and of Prang's "Natural History Series." These admirable illustrations of animal, vegetable, and insect life, not only add to the interest and cheerfulness of the classroom, but are suggestive to the pupils and helpful to the teacher. But more of this sort of thing is needed. A thousand dollars could be profitably spent in the purchase of models, maps, pictures, and specimens of various kinds, to say nothing of physical and philosophical apparatus. If object teaching is of advantage to the normal child, it becomes absolutely essential to the deaf or blind. A man trained to scientific methods and nomenclature may identify specimens from published descriptions, but no language can convey to the deaf-mute or blind child a definite and correct idea of a grain of wheat or a piece of coal, while a moment's handling of these products fixes forever in the mind their distinguishing characteristics. For this reason, a museum should be attached to every institution of this kind. The microscope, magic lantern, and stereoscope, are also important aids in educational work, and for the deaf and dumb especially, are of great pleasure and profit. It is hoped that the coming Legislature will appropriate money to expend in this direction, and thus facilitate a teaching task which is hard enough at best.

The department of oral instruction and lip reading has been in

successful operation since the publication of the last report. There have been under instruction forty pupils, distributed among seven classes. They have had an hour a day of training in articulation, and the result has been as favorable as could be expected. Of course the attainments of the pupils have been varied, and in making an estimate of progress one has to consider the starting point. The public generally is not aware of a distinction, well understood by those engaged in this profession, between the congenital and the semi-mute. The child born with malformed or defective organs of hearing grows up a mute, not from lack of vocal organs, but because he does not know how to use them. He has to be taught this use by long and patient process. Having no ear to guide and correct his speech the utterance is apt to be harsh and unmusical, while the tax upon the brain in remembering the phonetic power of our queerly spelled English words, is constant and severe; and yet excellent results, in the way of articulation, are sometimes obtained from these children who have never heard a sound.

But many children who find their way to institutions for the deaf and dumb are not born deaf. They are made deaf by the various diseases incident to childhood, such as scarlet and brain fevers, spinal meningitis and measles, these four maladies being responsible for about forty per cent of the pupils in this school. If the misfortune occurs before the child is eight or ten years of age, he gradually loses by disuse or forgetfulness the language he has previously acquired, and comes to be a *semi-mute*, not a very logical term, but, as before said, sufficiently well understood by those engaged in this work. With this class the teaching of articulation is to revive the lost power of speech, or to correct the habit of imperfect utterance and of mal-use of the vocal organs, into which the child has unconsciously fallen; and whatever may be thought of the expediency of teaching speech to a congenital mute, there is no question as to its advantage for the child who has retained some memory of the "lost art."

The *personnel* of the institution has not been largely changed since the last report. Miss C. E. Handy, teacher of articulation, resigned in September, 1882, and after some delay Miss Annie B. Garrett, of New York, was engaged to take her place, otherwise the corps of teachers remains the same. Dr. H. T. Legler was elected Physician, vice Dr. P. Wheeler, term expired. Mrs. M. S. Billings, Matron of Boys' Home No. 1, has resigned, and Miss M. A. Wiseman, an assistant matron, has been promoted to her place.

THE TRADE SCHOOLS.

The most notable event in the history of the institution for the past two years has been the reestablishment of an industrial department, for which the last Legislature made a small appropriation. Though the amount was but \$2,500, the money has been so judiciously expended as to make a good beginning in the equipment of a wood-working shop and a printing office. The latter is rather rudimentary in its appointments, but sufficient type and material have been purchased to give employment to ten or twelve boys, and their progress in type setting has been such as to justify further expenditure and development in this direction. A small monthly magazine has been published, that the pupils may have experience in practical work, and at the same time afford the public an opportunity of noting the prog-

ress and attainments which the nimble fingered deaf mute can make in a handicraft, remunerative, respectable, and peculiarly fitted to his silent life. As means increase we hope to add the somewhat kindred art of wood engraving to this department of instruction.

A further appropriation is needed for machinery to complete the furnishing and facilitate the economical working of the printing office.

The shop for teaching the use of wood working tools is better equipped, and equally successful in its operations. Ten benches, and as many sets of first class tools, have been purchased and put in place. A ten-horse power engine supplied with steam from the laundry boiler; a pony planing machine; a circular saw, with adjustable table; a jig saw, and a turning lathe, have been set up, with all proper shafting, connections, and belting.

The method of instruction pursued has been what is known as the "Russian system," by which a pupil is first taught the construction and framing of the fifteen or twenty fundamental forms to which all carpentry and cabinet making are reduced. The boys spend two hours a day in the shop, and the course should be completed in two hundred and forty hours, or one hundred and twenty days, of two hours each. The lad who took the prize for a set of best constructions, a boy fourteen years old, completed the course in two hundred and sixteen hours, and his work was declared by the competent judge who inspected the models, to be not discreditable to an average journeyman. Altogether, this department of the institution is a just matter of pride and gratification to the Board and to the State.

The new bakery and cooking school, for which an appropriation of \$5,000 was made, has not yet been completed, but it is hoped that the building will be erected and furnished before the Legislature convenes. The education of girls in the practical duties of the household and kitchen is a subject quite fully discussed in my last report, and nothing has occurred to change the views therein expressed. It offers to the young woman who must depend upon her own resources, a respectable and remunerative employment; it fits her to assume the important duties of wife and head of the household; it makes her a help and not a burden in the home of her parents; and, above all, it teaches her that domestic service is not a menial employment, but a respectable way of earning a livelihood. It thus has the effect, which all education in handicrafts has, of dignifying, not labor, but the laborer, an end which should be the purpose and endeavor of every school and government.

LIBRARY.

In the plan of the new school building, a room was set apart for library purposes, and during the past two years the beginning of a book collection has been made.

The library fund, which, by the proceeds of exhibitions, small bequests, and accumulated interest, had grown to about \$3,000, was drawn upon for fitting up cases, costing \$750, and \$1,000 was appropriated for the purchase of books. Cyclopedias, lexicons, standard histories, works of science and fiction, and general literature, to the number of about one thousand volumes, have been bought, and arranged upon the shelves. There is room for about two thousand volumes more, which we hope to accumulate from year to year.

IMPROVEMENT OF GROUNDS.

The grounds of the institution have been somewhat improved since the date of the last report, although the Legislature failed to make the much needed appropriation therefor. The money required was taken from the accumulated interest of the Durham Fund, the items of expenditure being accounted for in the financial statement. A stone terrace wall has been constructed in front of the educational building, with a flight of granite steps properly buttressed, so that visitors are now enabled to enter the front door, instead of gaining access by the rear porches, as has been the case for the two years since the school house has been occupied. The stretch below the terrace has been filled and graded, and the drives covered with rock. No shrubbery or grass has been planted, the lateness of the season and the scarcity of water making it not advisable to do so.

While the general appearance of the grounds has been vastly improved, there remains much to be done. A granite coping is needed to finish the terrace wall; surface gutters, to carry off the surplus water; a suitable entrance gateway, somewhat in keeping with the extent and plan of the grounds and the dignity of the State. The fencing of the whole property needs repairs, and much of it reconstruction. Built fifteen years ago, the portion around the hill and pasture lands, originally a four-board fence, has suffered from the field fires, which from time to time have swept over the hills, and has been patched with barbed wire till it affords little protection to our cattle or pasture.

The part inclosing the building site, gardens, and orchards, was constructed of square-topped, rough, pine pickets, now weather-beaten and unsightly.

There should be seventy-six rods of handsome front fence, high and strong enough to keep out marauders, and eighty rods of a cheaper, but effective sort, for side barriers, as protection to the orchards and garden.

Another indispensable improvement is a new barn and cow house. The present buildings are rickety and unwholesome. The barn was originally a cheap structure on the farm when purchased, eighteen years ago. It has long since served its purpose, and should now give place to a well arranged horse and stock barn, with capacity for stowing hay, feed, and agricultural implements, and special facilities for the economical care and feeding of cows, whose milk product already forms an important factor in the domestic administration of the institution.

The water question is still unsettled. A bill appropriating \$4,000 for this purpose was passed by both branches of the Legislature in 1883, but in the confusion of adjournment it somehow failed to reach the Governor's office, and was consequently lost. The bill was engrossed, and the State Printer held the receipt for its delivery to the clerk of the committee, but no farther trace could be found. As there was no opposition to the bill, there is no reason to suppose that the miscarriage was due to any unworthy motive, but was simply one of those accidents which sometimes occur in the best ordered legislative bodies. It is hoped, however, that the loss will be made good at the coming session.

A coal house for the storing of at least a year's supply of coal is also much needed. A convenient space has been graded adjoining

the site of the bakery and engine house, where a shed can be easily and cheaply constructed. The facilities for dumping from above would not only enable carts quickly to unload, but an arrangement of screens could be made, by which, at the same time, the fine and coarse coal would be separated. I trust the Board will urge upon the Legislature these various improvements.

I desire again to bring to your notice the need of a gymnasium. The same reasons urged in my last report exist to-day. The room is ready; the physical welfare of the pupils, especially the blind, calls for it; and the expenditure required is not large. I am sure the Legislature will not begrudge so important a feature in the equipment of the school.

FINANCIAL STATEMENT.

In presenting the following statement it is proper to say that it represents the actual receipts and expenditures for the two years under consideration. It has nothing to do with the balances, overdrafts, or deficits of previous years. It is intended for the use of those who are not versed in the technical methods of bookkeeping, and, taken in connection with the "Principal's dissections," gives the cost and quantity of the various articles consumed, and of the departments:

Receipts.

From State appropriation for two fiscal years ending June 30, 1884.....	\$83,999 70
From Principal.....	3,036 05
Total	<u>\$87,035 75</u>

Disbursements.

For salaries and wages	\$41,019 77
For groceries and provisions	17,594 92
For clothing	1,503 88
For furniture.....	2,036 44
For building and repairs.....	3,982 90
For fuel and lights.....	7,501 38
For laundry.....	2,275 13
For stable and dairy.....	3,690 83
For miscellaneous expenses.....	3,970 93
For salary Secretary and Treasurer.....	1,000 00
Total disbursements for ordinary current expenses for two years.....	<u>\$84,576 18</u>

Cost to the State per annum	\$42,288 09
Average attendance.....	153
Cost per capita.....	<u>\$276 39</u>

As a rule comparative statements of cost are of little value, because conditions are so varied. Number of pupils, proximity of coal fields, and sources of food supplies, and especially wages of servants, are all important factors to be taken into consideration. It is therefore with some hesitation that the following table of statistics is offered, carefully compiled from the latest report of each institution named:

STATE.	Class.	Per Capita.
Massachusetts	Blind	\$320 00
Massachusetts	Deaf and Dumb	325 00
Connecticut	Deaf and Dumb	271 00
New York, city	Deaf and Dumb	285 00
New York, Rome	Deaf and Dumb	261 00
New York, city	Blind	292 00
New York, Batavia	Blind	262 00
Pennsylvania	Deaf and Dumb	297 00
Pennsylvania	Blind	289 00
Maryland	Deaf and Dumb	290 00
Maryland	Blind	266 00
Washington	Deaf and Dumb	605 00
Virginia	Deaf and Dumb and Blind	375 00

Average cost per capita of thirteen Eastern institutions, \$318.

These figures are presented merely to convince those who are unacquainted with this work, and who compare the cost of this institution with that of insane asylums, that there must be conditions pertaining to the education of the deaf and the blind which do not enter into the care and support of the insane.

There will probably be not less than one hundred and seventy-five pupils to provide for during the coming two years, which, at \$265 per capita, will require an appropriation of \$45,500 per annum. The other special appropriations that ought to be made are as follows:

For fencing	\$5,000 00
For improving grounds	5,000 00
For increasing water supply	4,000 00
For new barn and cow sheds	8,000 00
For illustrative apparatus	1,000 00
For coal house	1,000 00
For fitting up gymnasium	1,000 00
<hr/>	
\$25,000 00	

These are all improvements that are absolutely essential to the effective working of the institution.

ACKNOWLEDGMENTS.

It may not be known to the public that the wife of Mr. Nathaniel Hawthorne was a sculptor of no inconsiderable merit, and that many years ago she executed a bust of Laura Bridgeman, the celebrated deaf, dumb, and blind pupil of Dr. Howe, in Boston. This forgotten work has recently been brought to light through the exertions of George H. Holden, Esq., of Providence, Rhode Island; and a wealthy lady of Boston, Mrs. Peter C. Brooks, has generously borne the expense of having casts made and sent to the various institutions for the blind. This school has received a copy, and we desire hereby to express our appreciation of the interesting gift, and our thanks to the donor.

The bust represents a girl about twelve or fourteen years old, and shows many of the characteristics which Laura Bridgeman developed and yet retains.

The cast attracts much attention from visitors, many of whom have heard of the pupil who made Dr. Howe famous.

The following papers have been sent free to the institution, and in the name of the pupils we hereby return acknowledgment and thanks for the same: *Sacramento Weekly Bee*, *The Deaf-mute Journal*, *The Michigan Deaf-mute Mirror*, *The Mutes' Companion*, *The Goodson Gazette*, *The Tablet*, *The Kansas Star*, *The Deaf-mute Optic*, *The Nebraska Mute Journal*, *The Vis-a-Vis*, *The Deaf-mute Hawkeye*, *The Wisconsin Deaf-mute Times*, *The Deaf-mute Advance*, *Our Little People*, and the *Valentin Hairy*.

We are also under obligations to the Hon. John Eaton, Commissioner of Education at Washington, for the publications of that department. These "circulars of information" and reports have all direct bearing upon educational matters; are timely and suggestive, and of great interest to the teacher who wishes to keep pace with the movement of the day in his profession.

We also desire to return thanks to the management of the Central Pacific Railroad Company for passes, and half fares to pupils, the pecuniary condition of whose parents and guardians made such favor a great boon to them.

Dr. R. E. Cole, of Oakland, is also entitled to thanks for his gratuitous and skillful services in dentistry.

With grateful appreciation of the coöperation and confidence which has been extended to me by the present Board, and its predecessors for twenty years, this report is respectfully submitted.

WARRING WILKINSON,
Principal.

INSTITUTION FOR THE DEAF AND DUMB, AND THE BLIND,
BERKELEY, November 1, 1884.

PRINCIPAL'S DISSECTIONS OF EXPENDITURES FOR TWENTY-FOUR MONTHS,
ENDING JUNE 30, 1884.

Groceries and Provisions.

Allspice, 18 pounds	\$4 50
Ammonia, 36 quarts	9 00
Arrowroot, 10 pounds	2 62
Bacon, 145 pounds	23 83
Baking powder, 72 pounds	32 50
Bath brick, 2 dozen	2 75
Beans, 2,586 pounds	93 81
Bread	46 25
Buckwheat, 318 pounds	14 97
Butter, 9,007 pounds	2,516 26
Canned goods	173 05
Capers, 3 dozen	6 00
Carb. ammonia, 11 pounds	3 05
Carb. soda, 64 pounds	3 84
Cayenne pepper, 2½ pounds	81
Cheese, 1,204 pounds	205 86
Chicory, 676 pounds	47 58
Chocolate, 74 pounds	16 10
Cinnamon, ground, 35 pounds	9 63
Cinnamon, whole, 4½ pounds	71
Citron, 20 pounds	4 68
Cloves, ground	50
Cloves, whole, 5 pounds	3 25
Cocconut, ground, 19 pounds	7 10
Coffee, 1,736 pounds	209 78
Amount carried forward	\$3,437 43

Amount brought forward.....	\$3,437 43
Cooking wine.....	16 40
Cornstarch, 60 pounds.....	6 30
Cornmeal, 1,000 pounds.....	26 15
Crackers, 2,434 pounds.....	151 18
Cracked wheat, 825 pounds.....	24 10
Cranberries, 2 barrels.....	33 00
Cream tartar, 22 pounds.....	8 90
Crushed Indian, 120 pounds.....	9 75
Currants, 574 pounds.....	54 17
Eggs, 300 dozen.....	108 56
Extracts.....	11 13
Farina, 40 pounds.....	4 25
Fish, fresh, 3,046 pounds.....	180 78
Fish, salt, 1,390 pounds.....	108 95
Flour, white, 357 barrels.....	1,963 58
Flour, graham, 6 barrels.....	33 22
Fruit, dried, 2,795 pounds.....	304 24
Fruit, fresh.....	265 82
Gelatine, 4 dozen.....	7 00
Ginger, ground, 60 pounds.....	13 53
Hams, 537 pounds.....	98 84
Hominy, 330 pounds.....	15 90
Honey.....	6 30
Hops, dried, 23 pounds.....	10 70
Horseradish.....	4 50
Hulled corn.....	4 50
Lard, 1,640 pounds.....	239 54
Macaroni.....	39 55
Mace, 12 pounds.....	7 99
Malt, 55 pounds.....	1 10
Meat, 66,599 pounds.....	5,760 48
Molasses, 134 gallons.....	30 05
Mustard, 86 pounds.....	14 95
Nutmegs, 5 pounds.....	4 50
Oatmeal, 800 pounds.....	40 75
Olive oil, 15 dozen.....	74 50
Oysters.....	5 00
Pearl barley, 150 pounds.....	8 25
Pepper, black, 90 pounds.....	16 09
Peas, split, 25 pounds.....	1 37
Pickles, 20 gallons.....	6 20
Potatoes, 78,751 pounds.....	865 71
Potted meats.....	35 15
Poultry.....	178 17
Raisins, 10 boxes.....	24 00
Rice, 1,500 pounds.....	80 50
Sago, 50 pounds.....	3 70
Saleratus, 48 pounds.....	3 00
Sal soda, 3,927 pounds.....	68 79
Salt, coarse, 2,270 pounds.....	15 31
Salt, table, 3,980 pounds.....	31 30
Sapolio, 18 dozen.....	18 00
Sauce, Worcestershire, 4 gallons.....	6 00
Silicon, 11 dozen.....	11 40
Soap, brown, 6,380 pounds.....	396 00
Soap, castile, 924 pounds.....	138 55
Soap, toilet.....	15 35
Sugar, brown, 12,445 pounds.....	1,070 36
Sugar, crushed, 2,047 pounds.....	236 26
Sugar, granulated, 2,954 pounds.....	334 52
Sugar, powdered, 660 pounds.....	82 92
Syrup, 808 gallons.....	479 97
Tapioca, 30 pounds.....	2 40
Tea, 678 pounds.....	258 30
Thyme, sage, etc.....	1 78
Vegetables.....	17 45
Vermicelli.....	24 00
Vinegar, 137 gallons.....	31 43
Yeast, compressed.....	4 10
	<hr/>
	\$17,594 92
Amount carried forward.....	\$17,594 92

Amount brought forward \$17,594 92

Salaries and Wages.

Principal and teachers	\$22,113 03	
Physician, clerk and matrons	6,929 94	
Servants and services	10,978 50	
Gardener	720 00	
Extra labor	9 00	
Foreman printing office	221 00	
Foreman mattress shop	48 30	
Treasurer	1,000 00	
		\$42,019 77

Clothing.

Bark	\$1 60	
Blacking, 30 dozen	17 18	
Blacking brushes, 5 dozen	17 25	
Boots and shoes	400 79	
Buttons	11 57	
Clothes brushes	2 00	
Collars, paper	13 30	
Collar buttons	1 60	
Combs	12 05	
Corsets	3 00	
Dress goods	94 53	
Dressmaker	30 00	
Flannel	1 00	
Hair brushes	4 50	
Handkerchiefs	6 00	
Hats	44 96	
Hose	47 70	
Knitting cotton and yarn	9 40	
Machine oil	25	
Marking ink	7 50	
Merino shirts and drawers	34 17	
Nail brushes	3 25	
Neckties	1 13	
Overalls	18 25	
Pants	6 50	
Pins and needles	11 13	
Repairing boots and shoes	328 65	
Rubber overshoes	30 41	
Scissors	2 75	
Shirts, check	43 00	
Shirts, white	30 90	
Shoe laces	7 65	
Silesia	12 18	
Suits of clothes	199 00	
Suspenders	9 52	
Thread and cotton	30 24	
Tooth brushes	2 62	
Trimnings	6 35	
		\$1,503 88

Furniture.

Baskets	\$4 50	
Bedsteads	144 00	
Bed ticks and ticking	19 43	
Blankets	113 00	
Brooms	82 50	
Carpets and lining	37 25	
Carpet cleaning	79 38	
Chairs	44 50	
Chamois skins	3 10	
Clock repairing and keys	16 80	
Crockery, cutlery and glassware	313 22	
Curtains and curtain goods	27 00	
Dust brushes	45 50	
Dust pans	4 75	
Feathers	34 40	
Feather dusters	32 55	

Amount carried forward \$1,001 88 \$61,118 57

Amount brought forward.....	\$1,001 88	\$61,118 57
Gas and lamp chimneys.....	13 50	
Hair.....	101 21	
Kitchen utensils.....	62 53	
Looking glasses.....	15 00	
Mattresses and repairing.....	76 07	
Mop cloths.....	56 50	
Mop handles.....	12 38	
Mosquito netting.....	50	
Music stand.....	15 00	
Napkins.....	14 00	
Pails, wooden.....	7 48	
Paper bags.....	3 18	
Preserve jars and cans.....	13 65	
Picture frames and cord.....	39 45	
Quilts.....	16 00	
Range plates and repairs.....	93 89	
Scales.....	4 50	
Scrub brushes.....	60 54	
Sheeting.....	118 25	
Sponges.....	5 33	
Stools.....	13 00	
Table cloth.....	32 95	
Tinware and repairs.....	120 22	
Towels and toweling.....	71 29	
Wall paper and hanging.....	45 00	
Washstands.....	13 00	
Wisp brooms.....	6 01	
Wire and wire cloth.....	4 13	
		\$2,036 44

Building and Repairs.

Barbed wire.....	\$27 54	
Belting.....	9 14	
Fire clay.....	4 50	
Glass and putty.....	109 15	
Hardware.....	292 55	
Lumber.....	516 86	
Millwork.....	7 90	
Paints, oils and brushes.....	55 28	
Packing for engine.....	1 44	
Painting.....	739 23	
Plumber's supplies.....	444 01	
Repairing slate roofs.....	58 00	
Tank.....	20 00	
Wages, carpenter.....	1,678 70	
Window weights.....	18 60	
		\$3,982 90

Fuel and Lights.

Candles, 160 pounds.....	\$26 70	
Charcoal, 7 sacks.....	4 65	
Coal, 373 $\frac{1}{2}$ tons.....	3,863 24	
Coal oil, 250 gallons.....	68 90	
Gasoline, 6,376 gallons.....	1,642 64	
Lard oil, 60 gallons.....	68 25	
Matches.....	24 75	
Wages, engineer.....	1,800 00	
Wax tapers.....	2 25	
		\$7,501 38

Laundry.

Baskets, 10.....	\$24 50	
Bluing, 80 pounds.....	18 82	
Brushes.....	1 50	
Clothespins.....	1 10	
Irons.....	3 02	
Iron furnace-pan.....	5 00	
Sal soda, 1,151 pounds.....	19 24	
Soap, brown, 563 pounds.....	34 15	
Soap, powdered, 4,650 pounds.....	343 75	
		\$74,639 29

Amount carried forward.....	\$451 08	\$74,639 29
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Amount brought forward.....	\$451 08	\$74,639 29
Starch, 708 pounds.....	68 50	
Wages.....	1,744 65	
Washboards.....	4 75	
Wax, white, 8 pounds.....	5 05	
Wire clothes line.....	1 10	

\$2,275 13

Stable and Dairy.

Barley, ground, 10,615 pounds.....	\$139 24	
Bran, 33,977 pounds.....	296 96	
Castor oil, 4 gallons.....	5 85	
Cracked corn, 3,725 pounds.....	70 63	
Currycombs and brushes.....	2 60	
Cutting hay.....	12 00	
Harness and repairs.....	15 50	
Hay, 78½ tons.....	995 82	
Horseshoeing.....	86 75	
Middlings, 9,592 pounds.....	120 31	
Milk pails and pans.....	3 00	
Oats, 10,572 pounds.....	207 16	
Oil meal, 4,826 pounds.....	80 18	
Pigs, 27.....	62 00	
Repairing wagons and buggies.....	92 50	
Straw.....	31 40	
Wages.....	1,412 50	
Wheat.....	54 93	
Whips.....	1 50	

\$3,690 83

Miscellaneous.

Advertising.....	\$309 60	
Batteries and telephones.....	446 31	
Binding books.....	5 00	
Blacksmithing.....	99 13	
Books, stationery, and school apparatus.....	476 16	
Cartage.....	76 85	
Cement.....	111 00	
Car tickets.....	2 75	
Collection charges on State warrants.....	28 69	
Closet paper.....	11 50	
Christmas expenses.....	61 44	
Drugs and medicines.....	290 34	
Expense Clerk to city.....	15 45	
Express charges.....	130 65	
Expense pupils' parties.....	36 00	
Expense pupils to oculist.....	10 45	
Exchange on draft.....	50	
Expense pupils to Fair.....	10 70	
Farm implements.....	48 60	
Funeral expenses.....	30 00	
Ferry.....	47 30	
Freight on supplies.....	130 73	
Fly paper.....	8 25	
Granite.....	171 25	
Horse keeping.....	13 25	
Hair picker.....	55 00	
Ice.....	10 60	
Improving grounds.....	22 00	
Lime.....	94 80	
Lye for tree wash.....	8 30	
Music for blind.....	20 35	
Night watchman's clock.....	67 90	
Paper for printing office.....	21 29	
Pupils' traveling expenses.....	45 65	
Printing.....	15 75	
Postage and stamps.....	123 27	
Repairing and tuning pianos.....	35 00	
Rope.....	1 00	
Rubber hose.....	15 00	
Seeds and plants.....	5 20	

Amount carried forward..... \$3,103 01 \$80,605 25

Amount brought forward.....	\$3,103 01	\$80,605 25
Surgical apparatus.....	40 00	
Subscription to Deaf and Dumb Annals.....	40 20	
Subscription to San Francisco Merchant.....	3 00	
Subscription to Magazine for Blind.....	14 00	
Sealing wax.....	75	
Sand.....	56 90	
Sewer pipe.....	49 84	
Traveling expenses.....	23 20	
Twine.....	6 54	
Telegrams.....	29 38	
Tiles for kitchen floor.....	8 25	
Type.....	83 38	
Water, 974,966 gallons.....	487 47	
Wrapping paper.....	15 01	
		3,970 93
Total expenditures.....		<u>\$84,576 18</u>

TREASURER'S STATEMENT.

Receipts and Disbursements for the Two Years Ending June 30, 1884.

GENERAL STATEMENT.

	Thirty-fourth Fiscal Year.	Thirty-fifth Fiscal Year.	Total.
<i>Receipts.</i>			
From appropriation for thirty-third fiscal year, received too late for last report.....			\$3,982 54
From appropriation for support	\$40,000 00	\$43,999 70	83,999 70
From Principal.....	1,390 69	1,645 36	3,036 05
From Durham Fund, transferred.....	2,023 35	826 26	2,849 61
From appropriation for Industrial Department.....		2,500 00	2,500 00
	\$43,414 04	\$48,971 32	
Total receipts.....			\$96,367 90
<i>Disbursements.</i>			
July 1, 1882, overdrawn balance thirty-third fiscal year.....			\$2,684 70
Salaries and wages.....	\$21,825 94	\$23,055 83	44,881 77
Supplies.....	16,690 78	20,454 78	37,145 56
Treasurer's salary.....	500 00	500 00	1,000 00
Miscellaneous expenses.....	70 38	588 69	659 07
Water account.....	2,349 88		2,349 88
Improvement of grounds.....	1,548 85		1,548 85
Furnishing Educational Building.....	1,963 62		1,963 62
Industrial Department.....		2,500 00	2,500 00
	\$44,949 45	\$47,099 30	
Total disbursements.....			\$94,733 45
Balance on hand June 30, 1884.....			1,634 45
Total.....			\$96,367 90

DETAILED STATEMENT.

GENERAL FUND.

Receipts.

From appropriation for support for two years.....	\$83,999 70
From appropriation for thirty-third fiscal year	3,982 54
From Principal—cash from pupils, etc.....	3,036 05
From Durham Fund.....	826 26
From Durham Fund to make good amount transferred to Additional Home and Refectory Account	550 50
Total receipts.....	\$92,395 10

Disbursements.

Overdrawn balance thirty-third fiscal year.....	\$2,684 70
Salaries and wages.....	44,881 77
Supplies.....	37,145 56
Treasurer's salary.....	1,000 00
Miscellaneous expenses.....	659 07
Improvement of grounds.....	1,548 85
Transferred to Water Fund (included in receipts).....	2,349 88
Transferred to Furnishing School Building Fund (included in receipts).....	490 82
Total disbursements.....	\$90,760 65
Balance cash on hand.....	1,634 45
	\$92,395 10

WATER FUND.

Balance on hand last report taken from General Fund	\$2,349 88
Paid for labor and supplies as per vouchers	<u>2,349 88</u>

FURNISHING EDUCATIONAL BUILDING FUND.

Received from Durham Fund	\$1,472 80
Received balance of Furnishing Girls' Home Fund from General Fund	490 82
	<u>\$1,963 62</u>
Paid furnishing building, as per vouchers	<u>\$1,963 62</u>

INDUSTRIAL DEPARTMENT FUND.

Received from appropriation	\$2,500 00
Paid for machinery and tools, as per vouchers	<u>2,500 00</u>

LIBRARY FUND.

Balance on hand last report	\$3,003 34
Received from dividends	151 63
	<u>\$3,154 97</u>
Paid for books, etc., as per vouchers	<u>1,755 68</u>
Balance cash on hand	<u>\$1,399 29</u>

LOUIS STRAUSS FUND.

Balance on hand last report	\$5,239 84
Received from interest account Durham Fund	300 00
Received from dividends	49 55
	<u>\$5,589 39</u>
Less mortgage investment	<u>5,000 00</u>
Balance cash on hand	<u>\$589 39</u>

DURHAM FUND.

Balance on hand last report	\$11,720 63
Received from interest and dividends	5,167 65
Received mortgage loan, repaid	30,000 00
Total	<u>\$46,888 28</u>

Disbursements.

Paid Durham Scholarships	\$1,033 31
Transferred to Educational Building Fund	2,597 23
Transferred to Furnishing Educational Building Fund	1,472 80
Transferred to Additional Home and Refectory Fund	550 55
Transferred to Louis Strauss Fund, apportionment of interest received	300 00
Transferred to General Fund	826 26
Miscellaneous vouchers	743 05
S. H. Long, piano	300 00
J. Gorman, instruction mattress shop	33 25
Improvement of grounds	785 20
Mortgage investment	36,000 00
Total disbursements	<u>\$44,641 65</u>
Balance cash on hand	<u>2,246 63</u>
Total	<u>\$46,888 28</u>

ORGAN FUND.

Balance on hand last report	\$1,226 44
Received from interest	109 82
Total cash on hand	<u>\$1,336 26</u>

CASH BALANCES.

Union Savings Bank, Oakland, California, June 30, 1884.

Credit of Durham Fund	\$2,246 63
Credit of Louis Strauss Fund	589 39
Credit of Library Fund	1,399 29
Credit of Otgan Fund	1,336 26
Credit of General Fund	1,634 45
Total	\$7,206 02
Balance of appropriation for thirty-fifth fiscal year not drawn from State Treasury	\$0 30

MORTGAGE INVESTMENTS.

Horace Gushee	\$10,000 00
Henri Windel	15,000 00
Maus & Straude	16,000 00
Total	41,000 00

W. L. PRATHER,
Secretary and Treasurer.

OAKLAND, CAL., July 1, 1884.

LIST OF PUPILS IN THE INSTITUTION SINCE JULY 1, 1882.

NAMES.	TOWNS.	COUNTIES.
<i>Deaf and Dumb—Males.</i>		
Aldersley, Lyell	Napa City	Napa
Best, William C.	Napa City	Napa
Billings, Charles W.	Oakland	Alameda
Black, Jos. F.	Livermore	Alameda
Bucking, George F.	San Francisco	San Francisco
Butler, Louis L.		
Cator, Azro A.	San Francisco	San Francisco
Christeen, Fred. W.	Benicia	Solano
Christensen, L. O.	Hollister	San Benito
Coder, Sherman B.	Ukiah	Mendocino
Cohn, Max	San Francisco	San Francisco
Connelly, John	San Francisco	San Francisco
Collischonn, Fred	Oakland	Alameda
Cotter, William	Haywards	Alameda
Coulter, Charles B.	San Andreas	Calaveras
Cushman, Ira D.	Georgetown	El Dorado
De Wolf, Joseph	San Francisco	San Francisco
Dilke, John T.	Sacramento	Sacramento
Dinsmore, Bruce	Clipper Gap	Placer
Dobner, Harry	Anaheim	Los Angeles
Dugan, Edward	Janesville	Lassen
Egan, William	San Francisco	San Francisco
Ewing, William	Walla Walla	Washington Territory
Funkenstein, Leon	San Francisco	San Francisco
Goodrich, Doney H.	Geyserville	Sonoma
Gross, Charles A.	Stockton	San Joaquin
Hadlock, Hathron	Berkeley	Alameda
Hannah, Andrew	Mendocino City	Mendocino
Harding, Josh. G.	San Francisco	San Francisco
Hatch, Joseph	Redding	Shasta
Hatton, J. S.	Napa City	Napa
Heckman, Fred. W.	San Francisco	San Francisco
Hoke, Harmon A.	West Butte	Sutter
Holman, Willis G.	Linden	San Joaquin
Iser, Gustav	San Francisco	San Francisco
Jacob, Isadore H.	San Francisco	San Francisco
Johnson, James H.	Madison	Yolo
Kaiser, George H.	Vallejo	Solano
Kavanaugh, William J.	Alameda	Alameda
Lake, Frank	Santa Cruz	Santa Cruz
Lambert, Norman	Carpenteria	Santa Barbara
Lewis, Beverly	Tracy	San Joaquin
Lipsett, Robert A.	San José	Santa Clara
Lohmeyer, Ed. W. F.	San Francisco	San Francisco
Lynch, William H.	Paicines	San Benito
McCarty, W. E.	San Francisco	San Francisco
McQuillan, Charles	San Francisco	San Francisco
Miller, Charles F.	Jenny Lind	Calaveras
Miller, Joseph	San Francisco	San Francisco
Olivas, Dolores	Santa Barbara	Santa Barbara
O'Brien, Daniel	San Francisco	San Francisco
O'Malley, John M.	Washington Corners	Alameda
O'Rourke, James P.	San Francisco	San Francisco
Pomber, Juan M.	Castroville	Monterey
Poyser, Harry	San Francisco	San Francisco
Price, Edmund M.	Salinas City	Monterey
Rahnstorff, George H.	Byron	Alameda
Raymond, Harry	Berkeley	Alameda
Redman, W. W.	Suisun	Solano
Redmond, G. S.	San José	Santa Clara

LIST OF PUPILS—Continued.

NAMES.	Towns.	Counties.
Reichsrath, Charles	Alameda	Alameda
Reynolds, Robert	Oakland	Alameda
Rosenbaum, Nathan	San Francisco	San Francisco
Saltenberger, George	San Francisco	San Francisco
Sanguinetti, Antone	Columbia	Tuolumne
Schilling, William	San Francisco	San Francisco
Schleweck, Simon	San Francisco	San Francisco
Schreiner, Henry	Freeport	Sacramento
Schroder, George	San Francisco	San Francisco
Selig, Isadore	San Francisco	San Francisco
Selig, Kossuth	San Francisco	San Francisco
Shaw, James H.	Salinas City	Monterey
Shoaf, George A.	San Francisco	San Francisco
Sievers, Charles	Stockton	San Joaquin
Smith, Ellsworth	Riverside	San Bernardino
Stewart, Francis	Wilmington	Los Angeles
Stewart, James H.	Orange	Los Angeles
Strobel, Fred. G.	San Francisco	San Francisco
Sullivan, T. W.	San Francisco	San Francisco
Taber, Hal	Gibsonville	Sierra
Taber, Henry W.	Gibsonville	Sierra
Tripp, William H.	Stockton	San Joaquin
Weidemuller, Charles	San Francisco	San Francisco
Williams, Halleck	Tracy	San Joaquin
Watson, Fred. W.	Napa	Napa
<i>Deaf and Dumb—Females.</i>		
Ankener, Frances L.	Sacramento	Sacramento
Ayers, Dora	Santa Rosa	Sonoma
Bradley, Arrenia J.	Chico	Butte
Bradley, Catherine	Chico	Butte
Campbell, Marie N.	Los Angeles	Los Angeles
Cleveland, May	Ukiah	Mendocino
Craddock, Rose	Shasta	Shasta
Crawford, Caroline J.	Berkeley	Alameda
Cohn, Celia	San Francisco	San Francisco
Cole, Elizabeth D.	Oakland	Alameda
Daggett, Mary E.	New Westminster	British Columbia
Darling, Sarah J.	Bear Valley	Mariposa
Decker, Delia	Chico	Butte
DeFrees, Mary A.	Oakland	Alameda
Degouy, Margueritte	St. Helena	Sonoma
Dobner, Ethel	Anaheim	Los Angeles
Doren, Theresa	San Pablo	Contra Costa
Durkee, Mary L.	San Francisco	San Francisco
Dugan, Mary E.	San Francisco	San Francisco
Eades, Ida	Lookout	Modoc
Emry, Frances E.	Chico	Butte
Ford, Catherine	San Francisco	San Francisco
Funkenstein, Pauline	San Francisco	San Francisco
Gand, Mabel A.	San Francisco	San Francisco
Gassagne, Adela	Los Angeles	Los Angeles
Gerstle, Frederica	Baker City	Oregon
Gilbert, Angele	San Francisco	San Francisco
Halloran, Maggie	Birds' Landing	Solano
Hatch, Adeline	Redding	Shasta
Horrick, Lizzie	San Francisco	San Francisco
Howell, Marcia	Poplar	Tulare
Johnson, Lucy	San Francisco	San Francisco
Kiddell, May G.	Sacramento	Sacramento
Kuffel, Willina	Bloomfield	Sonoma
Ledden, Gertrude	San Francisco	San Francisco
Leonard, Hattie E.	Oakland	Alameda
Lewis, Josephine	Tracy	San Joaquin
Mauzy, Laura	San Leandro	Alameda
McLaughlin, Sophie	San Rafael	Marin

LIST OF PUPILS—Continued.

NAMES.	Towns.	Counties.
Mucha, Rosa	San Francisco	San Francisco
Munson, Mary E.	Eureka	Humboldt
Müth, Elizabeth	Oakland	Alameda
Norton, Frances A.	Oakland	Alameda
Porter, Fannie E.	Turlock	Stanislaus
Reynolds, Emma	Oakland	Alameda
Ross, Nellie	Napa City	Napa
Schütz, Mathilda	San Francisco	San Francisco
Sieferman, Louisa	Woodland	Yolo
Sieferman, Emile	Woodland	Yolo
Thorpe, Charlotte C.	San José	Santa Clara
Wardlow, Helen L.	San Francisco	San Francisco
Welch, Nellie	Virginia City	Nevada
Wells, Sara Z.	Sacramento	Sacramento
Westfall, Dora A.	Chico	Butte
Wright, Honora C.	San Francisco	San Francisco
<i>Blind—Males.</i>		
Burkhardt, Frank R.	Marysville	Yuba
Calvert, George	San Francisco	San Francisco
Cooper, Fred. V.	Portland	Oregon
Durham, John O.	San Francisco	San Francisco
Foley, Dennis	San Francisco	San Francisco
Foster, Henry W.	San Francisco	San Francisco
Hull, Herschel V.	Stockton	San Joaquin
John, Peter R.	Livermore	Alameda
King, Frank J.	Alameda	Alameda
Kleutsch, Frank J.	San Francisco	San Francisco
Lehe, Joseph	Virginia City	Nevada
Maduro, Joseph	Wright's	Santa Cruz
O'Rourke, James	San Francisco	San Francisco
Perry, Newell L.	Millville	Shasta
Richards, Lewis	Berkeley	Alameda
Sedgwick, Thomas	Berkeley	Alameda
Smith, Cecil H.	Oakland	Alameda
Staggs, William A.	Napa City	Napa
Weider, Daniel	Oakland	Alameda
<i>Blind—Females.</i>		
Alderson, Clara	Oroville	Butte
Clement, Catherine	San Francisco	San Francisco
Dalton, Nellie	Vallejo	Solano
Eastman, Mary W.	San Francisco	San Francisco
Fallon, Kate	West Berkeley	Alameda
From, Sorine W.	Salinas	Monterey
Foley, Kate	Duarte	Los Angeles
Haggerty, Carrie	San Francisco	San Francisco
Levy, Nathalie	San Francisco	San Francisco
Logan, Elizabeth O.	Penryn	Placer
Madrid, Esperanza	Visalia	Tulare
Mast, Augusta E.	San Francisco	San Francisco
Mast, Emma L.	San Francisco	San Francisco
Mullany, Dorenda	San Francisco	San Francisco
Penny, Ada	San Francisco	San Francisco
Perrot, Ella	Oakland	Alameda
Roth, Katie L.	Sacramento	Sacramento
Smith, Johanna E.	San Francisco	San Francisco
Taylor, Agnes M.	San Francisco	San Francisco
Ziegenbein, Ettie	Oakland	Alameda

TERMS OF ADMISSION.

The California State Institution for the Deaf and Dumb, and the Blind is located at Berkeley, about four miles north of the City of Oakland. Between San Francisco and Berkeley a steam ferry plies almost every half hour in the day, and from Oakland a horse railroad is constructed, which lands passengers within easy walking distance of the institution.

First—The institution offers its benefits to all deaf and dumb or blind persons who are of age suitable for instruction, and who are of sound intellect, and free from vicious habits and contagious or offensive diseases.

Second—No charge is made for pupils from this State, except for clothing and traveling expenses.

Third—Pupils from other States or Territories are charged three hundred dollars per annum, payable quarterly in advance. No deduction is made from annual charge, on any account, except in cases of prolonged sickness.

Fourth—The session begins on the fourth Wednesday of August, and closes the second Wednesday of June. Parents are earnestly requested to enter, or return their children, promptly at the beginning of the term. Only in extreme cases will the pupils be permitted to leave before school closes.

Fifth—Pupils should be provided with comfortable clothing when they enter the institution, and their wardrobe renewed twice a year.

Sixth—All moneys designed for pupils should be placed in the hands of the Principal, to whom, also, all letters of inquiry, etc., should be addressed. Money orders should be drawn on the "Berkeley" Post Office; and all letters, packages, or trunks should be addressed, "Institution for the Deaf and Dumb, and the Blind, Berkeley, Alameda County, California."

Parents or guardians of applicants for admission, are requested to furnish written answers to the following questions:

1. What is the name of the applicant?
2. When and where was he born?
3. Is his deafness or blindness from birth; or is it from accident or disease? If so, at what age and from what cause did he become so?
4. Is his deafness or blindness total or partial? If the latter, what is the degree of hearing or sight?
5. Have any attempts been made to remove his deafness or blindness; and if so, what are the results?
6. Are there any other cases of deafness, blindness, insanity, or idiocy in the same family, or among the collateral branches of kindred? If so, how and when produced?
7. Was there any relation between parents or grandparents before marriage?
8. Has the child had the smallpox, scarlet fever, measles, mumps, whooping cough? Has he been vaccinated?
9. What are the names, nationality, occupation, residence, and Post Office address of parents?
10. What is the number of their children?

REPORT

OF THE

Lake Bigler Forestry Commission

TO

GOVERNOR GEORGE STONEMAN.

MADE IN ACCORDANCE WITH ASSEMBLY CONCURRENT RESOLUTION NO. 31,
PASSED BY THE TWENTY-FIFTH SESSION OF THE LEGISLATURE
OF THE STATE OF CALIFORNIA.



SACRAMENTO:

STATE OFFICE, JAMES J. AYERS, SUPT. STATE PRINTING.

1884.

ASSEMBLY CONCURRENT RESOLUTION, NO. 31.

INTRODUCED BY MR. COLEMAN, FEBRUARY 6, 1883.

Assembly Concurrent Resolution, relative to the appointment of a Commission to inquire into and report a plan for the Preservation of the Forests on the California Shore of Lake Bigler.

Resolved by the Legislature of the State of California, the Assembly and Senate concurring, as follows:

WHEREAS, it should be the duty of the State to preserve from destruction, and reserve for the health, pleasure, and recreation of its citizens and tourists, the most noted, attractive, and available features of its natural scenery; and whereas, in the rapidly proceeding denudation of the forests on the shores of Lake Bigler the State is losing one of its most attractive features for tourists, and available, valuable, and pleasant resorts for residents; and whereas, it is right and expedient that the Legislature of this State should be informed whether any desirable plan can be adopted whereby the natural beauty of the California shore of Lake Bigler can be saved from the threatened total defacement, and the wooded shores be preserved to the people forever, for their benefit, health, and pleasure; therefore, be it—

Resolved, That the Governor of this State be directed to appoint a Commission of three citizens of this State, who shall inquire into the feasibility of such plan, and report to the Governor before the meeting of the next Legislature, the result of their inquiry, with any and all suggestions and recommendations their investigations may suggest; *provided,* that the members of such Commission shall serve without pay, or any remuneration whatever, nor incur against the State any expense whatever, except for the salary of one Secretary, such salary not to exceed in the aggregate three thousand dollars during the term of the Commission, and that the existence of the Commission shall cease from and after the date of its report to the Governor.

Resolved, That the Governor be directed to inform the Governor of the State of Nevada of the passage of these resolutions.

REPORT.

To his Excellency GOVERNOR STONEMAN:

When, in accordance with Assembly Concurrent Resolution No. 31, passed by the twenty-fifth session of the Legislature, you appointed the undersigned as members of the Lake Bigler Forestry Commission, work was at once begun to secure and place before you such facts and plans as the resolution contemplated. We, your Commissioners, saw, very soon after entering upon our investigations, that we would be disregarding a favorable opportunity to place before you and the Legislature many important facts, if the subject of this report should be limited by the letter of the concurrent resolution.

We have preferred to interpret the resolution according to its spirit, for we saw that the whole subject of forestry is one which California will be speedily forced to deal with as have other States and Nations; not at all in regard to the industry of lumbering, nor any industry growing immediately out of that, but in regard to the relation the forests of the State bear to the future of every branch of agriculture pursued in this State. The direction our investigations took naturally covered the whole subject of forestry as applied to this State; and to neglect to give the results of those investigations broadly, to confine our report strictly to the bearing these facts have to Lake Bigler's California forests, would deprive yourself and the Legislature of many facts pregnant with great interests to the very welfare of the State. Moreover, what affects the whole State affects every part, and in first dealing with the subject of forestry as it affects the whole State, we feel that the direct object of our investigations, the perpetuity of the forests of Lake Bigler, is at all times being subserved. Writing on this very subject H. W. S. Cleveland, one of the best authorities on native forests in this country, says: "Many once powerful nations have dwindled into insignificance in consequence of their neglect of this lesson which nature imperatively demands we should learn. Their fate should be to us a warning, as the efforts of the most intelligent nations of to-day should be to us an example, to save us from a like fate. The necessity for action is imminent and cannot be averted. The subject of the rapidly increasing demand and rapidly diminishing supply of timber throughout the country has been so thoroughly discussed by legislative committees, both State and National, by agricultural societies, and by able individual writers, that it would seem but a waste of time to bring forward the oft-repeated statistics in evidence of the danger that threatens us, and the urgent need of adopting measures of protection and relief." This writer assumes for all the States what does not exist here, namely,

an appreciation of the threatened danger and the imperative need for intelligent legislation on the subject.

It is because your Commissioners are convinced that a knowledge of the threatened danger to the agricultural interests of the State is not as general as it must be before proper legislation can be expected, that we present herewith a few authorities and opinions before stating our own conclusions.

The many respects in which portions of California and Switzerland are alike, is a familiar observation to us all, and no closer parallel has ever been drawn between the two countries than that furnished, unintentionally, by Mr. R. W. Phipps, of Toronto, in his report on forestry, furnished by order of the Canadian Government. This distinguished writer on this all important subject furnishes statistics to show that in no country in Europe has the waste of forests been more rapid or destructive than in Switzerland, and in none, perhaps, has this improvement been followed by more disastrous results.

Because of this destruction of the forests, the soil on the mountains being exposed to the wash of the rains, was rapidly carried away, leaving broad areas of naked rock, from which the water would at once sweep down the valleys in sudden and destructive inundations. Public attention has, however, been thoroughly awakened, and active preparations are in progress to remedy the evil. The cantons which have charge of these operations, have for some time been constructing works to control the streams and planting trees. The matter is now, in Switzerland, taken in hand by the National Government. It is not improbable that some, at least, of the evils common to the valley farmers of California and Switzerland, such as the filling of river channels and shoaling of the bays, and which in our State have been attributed exclusively to hydraulic mining and "slickens," are really partially due here, as in Switzerland, to the denudation of the hills of their natural rain and snow reservoirs—the forests.

Instances as pregnant with meaning to California as is the above, could be found, and in fact have been found in some part of nearly every long settled country. The *Encyclopædia Britannica*, with rather grim humor, in the article "Denmark," says: "Much of the wood which at one time covered nearly the whole of Denmark, having been cut down to make way for agriculture, and to supply fuel and timber, a vast area thus bared has become a sandy healthy desert."

To secure perfect healthfulness by making of the country an uninhabitable desert was a kind of health the Danish Government found very bad for its national existence, and effective measures are now being taken to preserve the remains of its wood land, and to encourage the planting of trees. Professor Marsh, in his essay, *The Earth as Modified by Man*, puts in this concise form the essential truth which Californians must have impressed upon their understandings to escape great and expensive evils: "The protection afforded by the forests against the escape of moisture from its soil by superficial flow and evaporation, insures the permanence and regularity of natural springs, not only within the limits of the woods, but at some distance beyond its borders, and thus contributes to the supply of an element essential to both animal and vegetable life."

It is not only both interesting and instructive to observe just how the forests insure the permanence and regularity of natural springs, and in a large measure modify floods from rainfall and melting snow, but a knowledge of how this benefit is effected will serve

to impress the value of forests on the minds of the people. This desirable knowledge we have found simply yet comprehensively communicated in the valuable report of R. W. Phipps, and quote him on that subject, as follows:

The whole forest in its natural state forms a reservoir admirably fitted to receive large supplies of moisture, to hold it for a lengthened time, and to part with it at intervals well calculated to benefit the vegetation of the surrounding country. The bed of the forest is a widely spread surface, piled thick with leaves, twigs, pieces of fallen branches, and remnants of decayed logs, covering another layer of the same substances in a state of partial decomposition, overlying yet another strata completely decomposed--altogether forming a deep pot or hollow framework, penetrated with myriads of pipes, tubes, and aqueducts, and interspersed with millions of miniature logs, blocking, and holding in position the flow of water, until the humus below fully absorbs it; while the whole surface of the earth is crossed, recrossed, and crossed again by a checker-work of partially elevated roots, the box-like openings between, which perform the same function. If we go below the surface we shall find the solid earth beneath the mass of vegetable decomposition pierced everywhere with upright and porous pillars of wonderful tubular structure--the large and perpendicular tap-roots which many trees possess pass deep into the solid, clayey strata, otherwise impermeable, and sending through the triturated earth which surrounds them a slow and steady supply of water to a thousand subterranean and spring-feeding channels, which, traveling away from the forests and under the cultivated fields, supply the great lower bed of moisture that, continually rising, fertilizes the upper soil.

Testimony as to the great value the forests of a country are to its agricultural interests, is marked equally by its abundance and its high authority. Professor Schacht, of the University of Bon, Germany, in his essay, *Les Arbres*, writes: "The fertility of a country depends on its supply of forest lands; for on this depend the foundation of soil, the precipitation of dew, the fall of rain, the steady current of rivers, the mitigation of the evil influences of unhealthy winds, and the growth of vegetation in the fields and meadows." The same authority adds, with more particularity: "Wherever the forests have disappeared the Spring inundations of the rivers have acquired a frequency unknown before. It cannot be disputed that the terribly destructive effects of the inundations of the Loire and Vistula of late years must be in great part attributed to the excessive denudation of the forests." A well-known American writer on the subject has crystallized into an epigram this truth, which your Commissioners hope to see soon recognized and acted upon in this State: "To disforest a mountain slope is to devote the height to barrenness, the valley to flood, and both to parching drought, when drought is most injurious."

The following, from the report of the New York Commissioners of State Parks, might have been written for this State, so close is its application to the question as it affects California: "There is nothing of greater importance to the agriculturists than rain at the proper season and in proper quantity; and science has demonstrated that the forests of a country are potent in the regulation of storms, the formation of clouds, and the descent of rain. Anything which vitally affects the interests of the farmer and producer affects the whole State, and demands the earliest attention of the people's representatives."

We might multiply almost indefinitely authorities to this point, but will, before taking up another branch of the subject, submit to you but two or three more views of men whose testimony is so important that it would be an injustice not to avail ourselves of it. Judge Warren Higley, President of the Ohio State Forestry Association, writes: "The various and immediate uses to man of trees and their products have caused their rapid destruction, until the threatened

dearth in this country is becoming alarming. This can be avoided only by convincing those who are most directly interested of the undeniable facts, and thereby induce the people to better protect existing forests, and to take early steps to plant new ones for the benefit of themselves and of future generations."

Dr. John A. Warder, of the same progressive Association of Ohio, writes: "A broad statesmanship in our National and State Legislature should at once take up the subject, and deal with it, year by year, until the great work shall be adequately begun. * * *

What we shall save in climate by preserving forest areas, or gain by their extension, is just so much to be enjoyed in addition to other compensations."

Professor Sargent, of Harvard University, who has given this question as much study as any one in America, says: "As moderators of the extremes of heat and cold, the benefits derived from extensive forests are undoubted, and that our climate is gradually changing through their destruction is apparent to the most casual observer. Our Springs are later, our Summers are drier, and every year becoming more so; our Autumns are carried forward into Winter, while our Winter climate is subject to far greater changes of temperature than formerly."

The Hon. Emil Rothe, who took special occasion to observe and study the results caused by the destruction of the forests in the northwest, reported as follows to the American Forestry Congress: "Thirty years ago steamboats drawing six feet of water made regular trips on the Upper Mississippi up to St. Paul. Now the navigation with boats of half that draught is uncertain. Nearly all the tributaries of the Upper Mississippi have also lost one half, or even more, of their former supply of water. Inundations in the Spring are more frequent, while now in the Summer-time the depth of many of these rivers average hardly more inches than could be measured by feet thirty years ago. Water-powers, which were formerly deemed to be inexhaustible, have been entirely abandoned, or their failing motive power has been replaced by steam." An official report upon the effect of the unwise destruction of forests in Ohio, says: "Many rivers have become diminished, among them the Cuyahoga (running through the City of Cleveland), and from the same cause—the destruction of forests—other Ohio streams are drying up in the Summer."

From the mass of authorities your Commission has collected on this one point, we shall quote but one more, Baron Von Steuben, a Prussian nobleman, now Royal Chief Forester of the German Empire. In a letter written by him, in 1882, he states: "Above all things, it is essential to prevent forest destruction where such would injuriously affect the fertility of the soil. It is important, then, to preserve and to cultivate judiciously those forests which stand at the headwaters and on the banks of the larger streams; because, through their indiscriminate destruction, fluctuations in the stage of water, sand bars, and inundations of arable lands, are occasioned."

Although it is not always just to judge of the importance of any matter pertaining to a country's welfare by the amount of attention that matter receives at the hands of the governing powers, still it is not out of place here to show that the evils of injudicious destruction of forests have, in many countries, passed beyond the state of theoretical discussion and unfruitful agitation. A great many countries have already realized the importance of this question, to a proper

understanding of which we are endeavoring to give some aid, and those countries, or most of them, have adopted practical measures for a remedy of the evil. Thus, Prussia has divided its twelve provinces into thirty forestry circles, with forest masters to represent the forest department in the councils of the local administration. There are two forest academics—one near Berlin, and one in Hanover.

Hanover, Saxony, and Bavaria, have government forestry associations, officers, and schools, independent of the Prussian Government.

Austria has establishments of forestry, with forest masters and twelve hundred employes, with a government forest academy at Mariabrunn, near Vienna, and a forest school at Bruhl.

In France there is a department of forestry, presided over by a director-general assisted by two chief officers, who care for the forests and enforce wise forestry laws with the aid of forest inspectors and guards. There is a government school of forestry at Nancy.

Switzerland has enacted laws for the preservation and renewal of forests, and has a forest police in mountain regions to enforce forestry laws.

Italy has strict forestry laws, and a government school of forestry near Florence.

In Russia, where, as in the United States, it has been a common belief that the forest is interminable, the Government has turned its attention energetically to the subject of forestry. The Minister of Public Domains has a Director of the Forest Department, and the organization of the service is very complete, including three schools of forestry.

Sweden has a Bureau of Forest Administration, and stringent legislation to assist its work.

Concerning other countries of Continental Europe it may be generally remarked that they are all awake to the necessity of forestry regulations, and there are many schools besides those we have mentioned.

In British India there is a wise general system of forest administration.

The Colonies of Australia and New Zealand are working earnestly in the matter of tree culture. South Australia has a Conservator of Forests and a Forest Board, working out practical forest legislation.

In addition to the Bureau of Forestry under the Department of Agriculture at Washington, many of the States of the Union have recently moved, and are still moving in the direction of intelligent treatment of this subject, which, in this State, until the appointment of this Commission, had been too long neglected. We would speak in detail of many of these State laws, all of which we have considered and many of which are deserving of earnest attention by the law makers of this State, but we hope to bring these laws before the Legislature through some other channel, and our desire is to keep this report within the briefest practicable limits.

That there is a demand based on the broadest needs of this State—based on what must be considered the very foundation of its future prosperity—for prompt and intelligent action in the matter of forestry in California, no one who has given the subject serious study can for a moment deny. Every method pursued by us in investigating this subject only served to emphasize this truth.

In the course of our investigations letters were sent to many persons throughout the State, including the leading agriculturists, horticult-

turists, and viticulturists, in all sections of the State, asking for the result of their observations regarding the effects upon the distribution and amount of rainfall, the permanency of springs, melting of snow, etc., produced by the partial destruction of forests in this State. The numerous intelligent and interesting responses received have been of great assistance in forming our conclusions as to the importance of the general subject, and in giving us valuable information on special points. Although we sought this information for our own better understanding of the subject, and not to publish the responses received to our inquiries, we feel that some good may result from quoting here from two or three letters received from widely separated portions of the State. A prominent orchardist, now residing in Hayward, writes:

I have observed that wherever in this State the hills and mountains are bare of timber or woods and shrubbery there are few or no permanent springs of water; the bare, naked gulches have no perennial streams of water running in them. The rain and snow which fall upon them during the wet season of the year, find their way into the gulches and cañons without hindrance, and are swiftly carried into the rivers below, producing, many times, sudden and devastating floods. A few days, or a few weeks at farthest, after the storms have subsided, under the influence of dry and desiccating winds and a hot sun, the naked hills and mountains have again resumed their dry sterile appearance. Not so with the wooded portions of the State. There you find permanent springs and streams of water. There you find a cooler temperature in the dry season and a milder temperature in the wet season. There you find the streams slower to rise after a storm, and slower to subside. There, if the moisture has fallen in the form of snow, protected by the shelter of the forest from the hot winds and direct sunshine, it is slow to melt, and the waters of the slowly melting snows percolate the earth, and, bursting out at a lower level in springs, become perennial, and form permanent mountain streams. The mountain range on the west side of the San Joaquin farm, Mount Diablo south, is in the main devoid of timber or shrubbery. In that range you find no permanent streams of water and very few springs; while in the parallel Coast Range, from San Francisco southerly, thickly covered as it is with timber and shrubbery, are found innumerable living springs and streams of water.

From these facts, and from many similar which I might note, I infer that the existence of forests exert a very great influence on the rainfall of a country, and on the permanency of its springs and streams, and on the temperature of its climate. * * * So here, in California, if our wooded mountains be stripped of their forests and the natural obstructions to the flow of water down their slopes be removed, the valleys below will be more subject to destructive floods, and permanent springs and streams will become things of the past. The valleys will become more subject to dry, hot, desiccating winds, and the value and productiveness of our cultivated lands will be injuriously affected thereby.

An orchardist and nurseryman of Los Angeles, categorically answering our inquiries, writes from that city:

I have often noticed the gradual failing of springs as the forests have been removed, and where once there were fine springs in or near the border of a forest, we find none since the removal of the forest. I have observed that the amount of water that our creeks and rivers carry at *certain times* is greater since the removal of forests than before; as forests serve to hold the water back, allowing it to sink into the earth, thereby making the streams permanent. Wherever forests have been removed I have noticed floods are more frequent and disastrous, as there is nothing to hold the water in check, and it finds its way at once to the rivers and water-courses.

This same writer replied to this question of the Commission, "What effect has the partial destruction of the forests in California had upon the value or productiveness of any cultivated lands?" as follows: "I hardly know how to answer this question, but it is evident it is beyond calculation."

The only other State correspondent, a well known horticulturist, from whom we shall quote, although there are many others whose evidence reads like a solemn warning to the State, writes from Sebastopol, Sonoma County, as follows:

I have been on this coast since 1850. * * * Rain has been more uncertain of late years, and snow on the mountains is not as universal and as seasonable as in former years. At this place within the last five years there has been much timber cut and land cleared up from the foot and back of the hills, with the result that vineyards that formerly did well on all sides are now injured very much by the early and late frosts.

We consider it particularly fortunate that the initiatory step in the direction of forestry legislation in this State was taken with a view to the preservation of the forests bordering on and in the vicinity of Lake Bigler. It is fortunate, because such legislation as your Commissioners will propose will be prompted, not alone by all the considerations we have thus far endeavored to present, but by the immediate additional consideration of saving to our State one of the most beautiful lakes in the world. It is not necessary to discuss the beauty and value of Lake Bigler. These are advantages of which every Californian is proud to boast, and which every Californian would feel not only a great and irreparable loss, but a disgrace, to have destroyed. Travelers, whose opinions are based on a familiarity with the so called "paradises of the world," are prompt to acknowledge that our claim of superior beauty and grandeur for the scenery of Lake Bigler, and the California mountain peaks which cradle it, are just, and deserve to be allowed. The preservation of this lovely gem in California's coronet is urged, first, as a fitting beginning in the direction of forestry legislation; second, because it is the duty of the State to keep for its people's enjoyment this perfect resort; and, third, because such an attraction as Lake Bigler brings thousands of desirable visitors within the State, to the State's profit and renown. It seems as if it need only be stated that unless speedy measures are taken Lake Bigler's hills will be first robbed of their forests, which add so much to the beauty of the lake, and next will be deprived of the rain and snow and springs, which make the lake itself. It seems as if this statement were alone necessary to secure the desired legislation. Already much of the Nevada shore of the lake has been denuded of forests. Fortunately, the greater line of the lake is in California, where, as yet, the work of destruction in the forests has not progressed so far as to either destroy the beauty of the scenes, or deprive the lake of its water supply.

We have found, upon investigation, that the proportion of entered land in Placer and El Dorado Counties, bordering on the lake, is so small that, if further entry could be stopped in Townships Nos. 12, 13, 14, 15, and 16 north, and Ranges Nos. 16 and 17 east, the California shore of the lake would be practically secured from denudation. This would result because of two causes:

- I. The comparatively small proportion of entered land, interspersed with land held by the State, would not induce lumbering operations or improvements, such as railroads, mills, flumes, branch roads, etc. To be profitable, such operations must have a larger timber area to draw upon than would be the case if further entry were stopped and the remaining lands preserved by the State. In speaking of entered land, here only the land entered by private individuals is referred to. The remaining land belongs either to the United States Government, the State of California (school land), or the Central Pacific Railroad Company (grant land). The problem presented to your Commissioners, when their investigation had reached this point, was to arrive at some plan whereby all the land in the territory described might pass into the possession of the State absolutely, or, in trust, to be preserved as

a State forest. We believe this can be done. In investigating various proposed means to this desirable end, we have communicated with the Interior Department at Washington and the Land Department of the Central Pacific Railroad Company. As a result, while we do not speak by absolute authority, as our own powers in our negotiations were limited, yet we believe that, so far as it lies in the power of the Government at Washington and the railroad company, the plan we shall propose will be carried out. It only remains for the State Government to acquiesce. We find that the area of the railroad grant extends south about two thirds of the line of the California shore of the lake; or, more exactly, through all of Townships Nos. 16 and 15, and nearly all of 14 north, Range 17 east.* Back from the shore line the railroad land in the same townships, Range 16 east, are considered in our recommendations. Considering the railroad land: First, we recommend that Congress be requested by this State to permit an exchange of railroad land in the area described for lieu lands of equal value, and as near the land in place as practicable. This means simply that in exchange for the odd-numbered sections in the district it is desired to reserve for the State, the railroad company be given in lieu even-numbered sections of equal value within the area of this grant, and in the vicinity of the land in place. This would give the United States Government possession of nearly all the land in the area described; of all, in fact, except the school land and the comparatively small amount entered by individuals. The railroad holds no land in Townships 12 and 13 north, Ranges 16, 17, and 18 east, which constitute the area bordering the south shore of the lake, and on the southern portion of the western shore, below the line of the railroad grant. Thus, when the exchange we have recommended shall have been made, the entire area of land bordering the California shore of the lake, and, generally speaking, for a township back, will be owned in as much part by the Government as if no railroad grant had been made there. Then this State should request of the Government a trusteeship, or actual ownership, of all its land in the area described, for the purpose of forever holding and preserving it as a State park, in connection with and for the sake of preserving Lake Bigler.

That the Government at Washington would grant such a request, made by this State, with the proper representation as to the object of the request, there can be no question. We are convinced, in fact, that bills introduced in Congress, first, for the granting of lieu lands to the railroad companies for its land in place in the area described; and, secondly, for the transfer to the custody of this State by the Government of such land, together with the land now held by the Government in this area, would be passed by Congress without opposition. These bills, introduced by our own Representatives, at the request of the Legislature of this State, would have all in their favor that your Commissioners have urged in regard to the necessity of making a beginning in the matter of forestry legislation, and would, also, have in their favor the precedents of many Acts of Congress in the direction of setting aside Government lands for public park purposes.

In regard to the State school lands in the area described the State itself could deal. We find that in the bordering townships the State school sections, in three or four instances, form a portion of the shore line. This, with the other sections not so favorably situated, could

* See accompanying map.

be, and we recommend should be, withheld from entry in the event of other lands being secured from the Government at Washington. Such lands actually bordering on the California shore of the lake as is not now owned by the Government, the State, or the railroad company, is, of course, private property, but, as such, in the event of the other land in the area becoming a State park, this private land would remain wooded and preserved in its natural condition. One reason for this we have already suggested, that is, that with the greater portion of the land reserved by the State and its forests carefully preserved, the amount of timber land owned by individuals would not prove an incentive for the outlay of capital required for railroad, flumes, mill, wagon road, and other accommodations for lumbering as it is carried on in this State.

II. But there is another and stronger reason why the forests on the land, especially the immediate shore land, privately owned, will be preserved when the region has become a State park. Such land will then, if they are not so already, become more valuable for private residences, hotels, places of resort, etc., than they would ever be for the timber which they might yield. We deem it a fortunate fact and calculated to assist the plan we propose, that much of the land on the shore belonging to individuals, is in the hands of wealthy citizens of this State, many of whom have already built thereon attractive Summer homes, and whose interests will always be identical with the State's in preserving the forests and all the natural beauties of the shores of Lake Bigler. All of this land on the shore privately owned will become valuable for the purposes we have suggested only if its forests are preserved, and for that reason we are of the opinion that the fact of private ownership will prove not a detriment to the plan we propose, but a valuable assistance in carrying it to a successful conclusion.

The map of the region, which your Commissioners have had drawn to accompany this report, and which is added hereto as an appendix, designates the ownership of every acre of land in the region, and shows that by no means all of the shore land is owned by individuals. There are several stretches, of miles in length, which, under the operation of the plan we propose, would come into the possession of the State and remain forever open to the free use of travelers for purposes of pleasure, rest, recreation, and healthful sport.

But we feel that there is no need of emphasizing in this report to any greater extent the advantages of preserving the forests about the California shores of Lake Bigler. It would be a valuable step in the direction of intelligent forestry legislation; it would preserve for the citizens of this State forever one of the most beautiful pieces of natural scenery in the world; it would preserve one of the State's greatest attractions to visitors from abroad, and it would be the first check in what must soon be a system of checks set up by the State to regulate the destruction of forests within its borders. The plan which we have developed from place to place in this report may be summarized as follows:

We suggest that the Legislature of this State request our Representatives in Congress to introduce a bill in Congress authorizing the granting of lieu lands to the Central Pacific Railroad (or the persons holding their lands), in exchange for lands in place in an area designated, such lieu lands to be of equal value and similar character as the land in place, and to be within the railroad grant and as near

the land in place as practicable, such request to emphasize the desire of the Legislature that such lieu land shall not exceed in value, nor be of superior quality in any respect, to the land in place; that the Legislature requests our Representatives in Congress to introduce a bill, following the passage of the above, for the transfer to this State, for the purpose of a public park, of all Government land in an area designated; that the land now held by this State in the area designated be withdrawn from sale and made part of such public park.

We also recommend that the Legislature create a permanent State Forestry Commission, with power and authority to act in all such matters as will aid the work of preserving the forests on the shores of Lake Bigler; preventing the unlawful cutting of timber in all parts of the State; encouraging the replanting of land denuded of redwoods; encouraging the planting of new land in suitable forest trees; collecting useful information concerning the adaptability of different forest trees to the different climates and soils of the State, and the special value and uses of different timber which shall be found adaptable to the State; the best mode of planting, caring for, thinning, and general treatment of growing timber trees; and the free dissemination of all such information to the citizens of the State, together with all such information concerning the profit, healthfulness, and other advantages of forest culture as will have a tendency to induce a general and intelligent pursuit of such industry.

To your Commissioners, who have made a long and close study of this most important subject of forestry as it affects the welfare of this State, it appears to be a most unfortunate omission on the part of the Legislature that such a permanent Commission as we have recommended has not already been created. While this State has remained in apparent unconsciousness of the threatened danger from the criminal waste of her magnificent forest wealth, the Government at Washington has already been startled into a consideration of the subject. In the Report on Forestry submitted to Congress in 1882, by the Commissioner of Agriculture, the writer of the report, Franklin B. Hough, says:

We believe that the time has now come when important portions of the heavily timbered lands still owned by the Government upon the Pacific Coast, and especially those occupied by the native redwood (*Sequoia sempervirens*), might be at once withdrawn from entry and permanently devoted to the production and maintenance of timber.

These grand supplies of timber are now, and have been since the first settlement of the country, undergoing a rapid waste; and the lumbering operations in these forests have been carried on in the most reckless and improvident manner, without yielding any revenue whatever to the Government or any adequate benefit to the country. In short, they have been plundered and destroyed, with scarcely a semblance of restraint, until a time can be foreseen when they will be exhausted altogether, and we shall be left wholly destitute of those inestimably valuable resources which, under judicious management, might be maintained for a long period. * * * It is well known that the natural limits of the redwood are of relatively small extent, not reaching far inland, and being limited to the western slope of the Coast Range within the State of California. * * * To the casual observer these supplies may appear inexhaustible, but there is nothing more fallacious or more dangerous than this imperfect conception of the limit of supply, in the midst of local abundance, and without allowance for the enormous demand or the vast exhaustion. * * * There are also large areas from which the timber has been cut away that are now lying waste, in which every condition favorable to a new plantation exists in full degree.

The redwood shows an unusual tendency to reproduction, and when we consider the relatively small district within which all the conditions essential to its prosperity exist, and the remarkable result to which they may lead, we cannot but regard these localities as peculiarly valuable for timber culture, and this still more from the fact that from their broken surface they are worth little for any other use.

If anything more than we had said was needed to impress upon the minds of the people of this State the absolute necessity for the work a permanent Forestry Commission would do, this last evidence we have quoted would seem to fill that need. The land from which redwood has been cut in this State is owned almost entirely by individual citizens of this State. Such land will lie waste and unproductive until the State shall supply through a Commission the knowledge and incentive which shall cause every acre of such barren land to be replanted, to the benefit and profit alike of the planter and the neighboring agriculturist, vineyardist, and orchardist.

And all that can be said in regard to the denuded redwood land, holds true with equal force in regard to every acre of land denuded of any kind of forest, except where such land is adaptable for farms, and also to more or less hill and valley land which has never yet been shaded, enriched, and made profitable by the growth of forest trees.

The intimate practical knowledge of and deep interest in the condition and needs of this State possessed by your Excellency, assures us that it is your desire to assist in any measure having the welfare of California and her people for its sole object. We therefore submit our plans and recommendations to your thoughtful attention, confident that our efforts will be but a second to the endeavor you will feel a pride in making toward reserving the forests on the California shores of Lake Bigler for a State park, and toward beneficial forestry legislation for the whole State. In this hope and expectation this report is respectfully submitted.

JAMES V. COLEMAN, Chairman.
SANDS W. FORMAN,
CHARLES M. CHASE,
Commissioners.

E. W. TOWNSEND, Secretary.

FOURTH ANNUAL REPORT
OF THE
BOARD OF RAILROAD COMMISSIONERS
OF THE
STATE OF CALIFORNIA
FOR THE
YEAR ENDING DECEMBER 31, 1883.



SACRAMENTO:
STATE OFFICE, JAMES J. AYERS, SUPT. STATE PRINTING.
1884.

MEMBERS OF THE BOARD.

G. J. CARPENTER, First District.....Placerville, El Dorado County
W. P. HUMPHREYS, Second District.....San Francisco
W. W. FOOTE.....Oakland, Alameda County
W. R. ANDRUS.....Secretary
J. P. CARROLL.....Bailiff
E. A. GIRVIN.....Stenographer

OFFICE OF THE BOARD OF RAILROAD COMMISSIONERS:

No. 14 Dupont Street.....San Francisco

FOURTH ANNUAL REPORT

OF THE

Board of Railroad Commissioners.

REPORT.

BOARD OF RAILROAD COMMISSIONERS OF THE STATE OF CALIFORNIA, }
AT OFFICE, IN THE CITY OF SAN FRANCISCO, January 7, 1884. }

To his Excellency GEORGE STONEMAN, Governor of the State of California:

SIR: The Constitution requires that this "Commission shall report to the Governor, annually, its proceedings and such other facts as may be deemed important." In compliance with this requirement, and in the exercise of the discretion with which it is coupled, the Commission deems it proper to make to your Excellency a general statement of its official acts and rulings, as they appear of record, accompanied by some of the reasons therefor.

THE COMMISSION—ITS RECENT ORIGIN AND OFFICIAL ATTITUDE.

As one of the constitutional offices of the State, of comparatively recent origin, being now in the first year of its second administration, it can hardly be said to have outlived its possible usefulness. But it must, like every branch of republican government, at the peril of its life, vindicate its right to exist. This can be done in two ways—by theory and results. In theory, the exercise of a power conferred, in the mode prescribed, by a majority of one, is "deemed conclusively just and reasonable." As this presumption follows and attaches to official acts and their probable results, their opponents have found it safest not to wait for them. Hence the frequency of foregone conclusions against the law and the facts.

But if neither rashly presuming upon its position and precedence before the Courts, nor leaning upon incompetent authority, nor deferring to any unauthorized censorship of its course, it has promptly substituted for the facile routine of inconsequential resolutions a thoroughly consistent and advancing plan of action, by methods and measures within the purview of the organic and statute law, it will find in the legitimate instruments of its authority the ready weapons of its defense. If it has resolutely taken the subject-matters of its jurisdiction out of partisan politics, and without fear, favor, or undue influence, has administered them as public trusts in the interest of all concerned, it has subverted one leading and paramount purpose of its creation. If, never prejudging any cause or question submitted for its decision, it has inflexibly adhered to the law and the facts, it need not fear the ultimate judgment of those having an honest interest in its administration, and can afford to wait for the justice it has done to others.

METHODS AND MEASURES IN THE LIGHT OF THE LAW AND THE FACTS.

What the methods and measures of its present incumbents have been and are, will be best and most conclusively shown by reference to the law and to the facts of record. Its most important administrative and remedial powers are defined and conferred by Section 22, Article 12, of the Constitution, in the clauses following:

First—Said Commissioners shall have the power, and it shall be their duty, to establish rates of charges for the transportation of passengers and freight by railroad or other transportation companies, and publish the same from time to time, with such changes as they may make; to examine the books, records, and papers of all railroad and other transportation companies, and for this purpose they shall have power to issue subpoenas and all other necessary process.

Second—To hear and determine complaints against railroad and other transportation companies, to send for persons and papers, to administer oaths, take testimony, and punish for contempt of their orders and processes, in the same manner and to the same extent as Courts of record, and enforce their decisions and correct abuses through the medium of the Courts. Said Commissioners shall prescribe a uniform system of accounts to be kept by all such corporations and companies.

POWERS DEFINED AND PROCESSES PRESCRIBED BY THE CONSTITUTION.

These provisions of the Constitution are thus separately cited because they evidently define different functions and processes of the Commission. The first relates entirely to the "rates of charge for the transportation of passengers and freight." It confers the "power" and imposes the "duty" to "establish" and "publish the same from time to time," with the changes made; and, also, in the same connection, "to examine the books, records, and papers of railroad and other transportation companies." Thus the power and duty of investigation and action are equally imperative, and are, *ex vi termini*, and in their essential nature, as continuous and complicated as the business to which they relate. By the second, there is a distinct devolution of the judicial power to "hear and determine complaints," "in the same manner and to the same extent as Courts of record." The Commission has, therefore, held and decided that a case of this kind should be confined to the parties of record and the subject-matter, and not made an olla podrida of irrelevant and impertinent disputes.

SECTIONS OF STATUTE CORRESPONDING TO CONSTITUTIONAL PROVISIONS.

Chapter 59 of the Statutes of 1880, entitled "An Act to organize and define the powers of the Board of Railroad Commissioners" (approved April 15, 1880), is presumptively valid, and is cotemporary construction of the provisions we are considering. Distinguishing as the Constitution does between the leading functions of the Commission, Section 9 of said Act establishes rules of practice for cases of individual complaint, as follows:

SEC. 9. All complaints before said Board shall be in writing and under oath. All decisions of said Board shall be given in writing, and the grounds of the decisions shall be stated. A record of the proceedings of said Board shall be kept, and the evidence of persons appearing before said Board shall be preserved.

Section 11 prescribes the mode by which the Commission shall "establish or adopt rates of charges," as follows:

SEC. 11. Whenever said Board, in the discharge of its duties, shall establish or adopt rates of charges for the transportation of passengers and freight, pursuant to the provisions of the Constitution, said Board shall serve a printed schedule of such rates, and of any changes that may be made in such rates, upon the person, copartnership, company, or corporation affected thereby; and upon such service, it shall be the duty of such person, copartnership, company, or corporation to immediately cause copies of the same to be posted in all its offices, station houses, warehouses, and landing offices affected by such rates, or change of rates, in such manner as to be accessible to public inspection during usual business hours. Said Board shall also make such further publication thereof as they shall deem proper and necessary for the public good. If the party to be served, as hereinbefore provided, be a corporation, such service may be made upon the President, Vice-President, Secretary, or managing agent thereof, and if a copartnership, upon any partner thereof. The rates of charges established or adopted by said Board, pursuant to the Constitution and this Act, shall go into force and effect on the twentieth day after service of said schedule of rates, or changes in rates, upon the person, copartnership, company, or corporation affected thereby, as hereinbefore provided.

TO FIND AND DECIDE WHAT RATES OF CHARGE ARE JUST AND REASONABLE, THE ONLY REMEDY FOR EXTORTION AND DISCRIMINATION.

By these sections of the Constitution and statutes "rates," "rates of charge," and "change of rates," are a dozen times repeated and made the burden of investigation and regulation, orders and schedules. It follows that extortions and discriminations are not to be remedied by sweeping and perfunctory declarations that they exist and ought to be forbidden, but by reforming the rates in which they are found. To avoid the plodding process of examination, it is possible to assume without proof or knowledge, as is often done, that all are excessive, and, therefore, extortionate. But that *all are unequal*, and, therefore, discriminative, is a solecism too palpable to be excused on the score of any negligence or ignorance. And absurd as it is, it is no more so than the correlative proposition that unequal rates can be equalized, and discriminations eliminated therefrom, by uniform reductions.

While discarding these absurdities, the Commission has settled down to its work upon the theory that extortion may be predicated of each separate rate or class of rates, and, if found to be too high, reduction to reasonable compensation is the rightful remedy; and as discrimination can be affirmed only of two or more rates for similar equal services, and consists in their inequality, the only possible remedy is by changes up or down, to adjust them to each other and to the service. If it is only when rates are thus "established or adopted," changed or regulated, reduced or equalized, by lawful orders and schedules (which, if not waived, are imperatively required), that they are to be "deemed conclusively just and reasonable," it follows that then, and not till then, can fines or forfeitures for their violation be recovered or enforced.

CONSTITUTIONAL PROCESS OF INVESTIGATION AND RULE OF DECISION.

This much debated function of the Commission is defined and guarded with exceptional clearness in the Constitution, and concerning it there should be no confusion of ideas or purposes. Its subject-matters are "rates" and "rates of charge;" its ultimate purpose, to "establish or adopt," or "change" them, "from time to time," so as to eliminate therefrom discriminative inequalities and extortions; its modes of procedure, investigations and comparisons, orders and schedules. Each and every one of eighty thousand existing rates, in its relations to all the rest, and to the governing factors of transportation, is the subject of investigation. What it ought to be, the relative

cost and conditions of the service being considered, is the question to be decided. That it ought to be reasonable compensation for the service, it would be unreasonable to question; and this is the necessary and conclusive inference of the Constitution. For, as it ordains, if rates of charge established by the Commission are to be "deemed conclusively just and reasonable," it is because they have been made and are so upon the principle presumed, which is itself the logical corollary of an otherwise ironical presumption.

THE RULE OF COMPENSATION IMPLIED IN EVERY FRANCHISE FOR
PUBLIC USE—THE RULE IN ENGLAND.

The rule of decision thus clearly embodied in the Constitution, with all its manifold implications, is before and after railroads and Railroad Commissioners. For three hundred years, in the absence of special agreement between the parties, for services rendered or to be rendered, it has been the measure of compensation and of universal application. Grounded in common sense, as a familiar principle of elementary law, it is the "perfection of reason," and has been made authoritative by a long and unbroken series of adjudicated cases. In England it is implied in every franchise for public use, whether by prescription time out of mind, or royal grant; and the duties must be reasonable and moderate, "though settled by the King's license or charter." (8 T. R. 606; 1 Harg. Law Tracts, 6-78; 4 Bacon's Abridg. 158; 12 East. 527.)

THE MEASURE OF CONTROL AND OF COMPENSATION IN THIS COUNTRY.

In this country, "the granting and acceptance of such charter creates a *quasi public trust*, and clothes the public with an *interest in the use of railroads*, which can be controlled by the public to the *extent of the interest therein*." (13 Fed. Rep. 78.) "The road once constructed, is instantan, and by mere force of the grant and law, embodied in the governmental agencies of the State and dedicated to public use." (1 Flippin, 142; 3 Kent, 458.) "And the reason why the use has always been held a public one is, that such a road is a public *highway*, whether made by the Government itself or by the agency of corporate bodies, or even by individuals, when they obtain the power to construct it from legislative grant." (16 Wall. 696.) "In consideration of the franchise they receive from the State, railroad companies agree to perform certain duties toward the public. The power of *determining* these duties and *enforcing* them is vested in the appropriate tribunals of the State." (63 Me. 278.) This power being coextensive with the public interest in such franchise, it may "fix a limit to that which shall in law be reasonable for its use. This limit binds the Courts as well as the people." (4 Otto, 178.)

POWER OF STATE NO LONGER DEBATABLE—RULE OF COMPENSATION
PRESCRIBED BY THE CIVIL CODE GOVERNING FACTORS OF TRANS-
PORTATION.

That the State or her appropriate tribunals have disarmed themselves, or been disarmed of this power, or at all relieved of its responsible exercise, will not be presumed, for, in the language of Judge Cooley, "It is so easy to say so that we will never believe it to be

meant when it is not said." They have, on the contrary, with few dissenting voices, faithfully guarded and affirmed the power, and have armed it with a rule of decision which is in itself no longer debatable. It is in the Civil Code as follows: "A common carrier is entitled to reasonable compensation and no more. If payment thereof be refused he may refuse to carry." (Civil Code, Sec. 2173.) As construed by all the Courts, in innumerable decisions, the language of this section means: "Reasonable consideration," and "for similar equal services" the "same compensation." To the same effect, and distinctly recognizing the equity of the rule, our immediate predecessors in this office unanimously adopted and entered of record the circumstantial declaration that in fixing "fares and freights on the various lines and portions of lines of transportation within this State," and in "determining what is a just and reasonable rate," they would consider the value of the services performed, distance of carriage, volume and direction of traffic, the general character thereof, to be fixed by classification as to volume, weight, value, the liability to accident, climatic influences, competition, grades, curvatures, and cost of maintenance."

THE LAW NO RESPECTOR OF PERSON OR CORPORATION—RULE OF
COMPENSATION FOR SERVICE SUBJECT ONLY TO ITS CONDITIONS—
TO BE APPLIED IMPARTIALLY.

As it is only by considering these underlying factors of the service that the compensation therefor can be made reasonable, the enumeration is important. It is clear cut and comprehensive. Excluding every element foreign to the inquiry, it includes the established tests, not themselves disputable, by which all Courts and Commissions, State and National, are necessarily governed. Without preference of person or corporation, owning and operating railroads, they apply to all alike, and relate to service and not to subsidies; to the continuing basis of charges for fares and freights, and not to the financial backing nominated in government bonds; to the present condition of existing railroads, and not to the eventful epoch when gigantic forces of peace and war conspired to build them.

GOVERNMENT DONATIONS AND LOANS OF CREDIT FOR THE CONSTRUCTION OF RAILROADS NOT OFFSETS TO CHARGES FOR SERVICE THEREON—THE GOVERNMENT AND PRIVATE PARTIES PASSENGERS ON THE SAME TRAIN.

Opposed to these principles and conclusions of law, there is only the unreconciled afterthought that government loans and donations for the construction of the Central Pacific, and other overland roads, were or might have been intended as offsets to charges for their operation. But the granting Acts, as ratified by the Legislature of the State, provide that such roads shall perform government service, "*at fair and reasonable rates of compensation, not to exceed the amounts paid by private parties for the same kind of service.*" Here again is the common law rule of service, and "*for the same kind of service,*" the same compensation. This would be plain enough without the express limitation to "amounts paid to private parties," whose rights are not affected by anything in the contract. And in an opinion upon the clause quoted, and directly to the point, the Supreme Court

of the United States has said: "The compensation at fair and reasonable rates, must be considered upon all the facts material to the issue, not to exceed the amount paid to private parties for the same kind of service." (The Union Pacific Railroad Company vs. United States, 14 Otto, 667.) Nothing, therefore, can be more evident than that the brilliant conception of reversionary bounties, and loans payable to the Government, but due to everybody, and subsidies that are perpetual surcharge of fares and freights, was inspired by the "wisdom that comes after the fact."

CONCLUSIONS OF LAW UPON PRINCIPLES OF ADJUDGED CASES.

For obvious reasons, the Commission has given due precedence and prominence to the law by which it was created and must be governed. In doing so it has endeavored to outline its own legal status and sphere of action, and to solve the puzzling and irrelevant problems into which its powers and duties are too often resolved. Generally and briefly, its conclusions are as follows:

First—It is a constitutional tribunal, with well defined official functions, to be exercised, subject only to the requirements of law, with becoming independence and impartiality in the interest of all concerned.

Second—Its judicial power to hear and determine complaints presupposes parties of record to be heard and specific issues between them to be determined, and is to be exercised "in the same manner and to the same extent as by Courts of record."

Third—Its remedial powers and duties relate exclusively to rates of charge for fares and freights, and when regularly exercised in the mode prescribed, its decisions are *prima facie* "just and reasonable."

Fourth—To make them in fact what they are presumed to be, they must, without preference of person or corporation, be based upon the varying conditions of the service, and be a reasonable recompense therefor.

Fifth—This is the rule of compensation for Government service incorporated in the Acts of Congress to aid the construction of the Central Pacific and other overland roads, and estops the Government, and *a fortiori* all other parties, from discriminating against them in payments for transportation thereon.

Sixth—The circumstantial and conditional factors of transportation are the admitted and necessary criterions of its cost and value, and are each and all of them inconsistent with any theory of unconditional uniform rates of fare and freight.

Seventh—To impose such rates upon the Central Pacific Company and leased lines under its management, at rentals ranging from \$100 to \$5,194 per mile, would be to make some of them bankrupt pensioners upon others; to convert relations beneficial to all into penalties upon such as have the least to gain by them; to substitute for reasonable compensation a rule of rank injustice, subject to which not one of them could have been constructed, and to arrest their extension to districts in squalid want of them, upon the mere pretense of favoring those who have them.

PROCEEDINGS AND METHODS OF THE COMMISSION CHRONOLOGICALLY
STATED AND REVIEWED.

The foregoing analysis of the law and rules of practice governing the Commission in both branches of its jurisdiction will serve to explain its acts, proceedings, and methods, what it has done, and declined to do.

On the ninth day of January, 1883, a resolution styling itself a schedule, and purporting, as such, to reduce rates of fare on the railroads named therein, was introduced by Commissioner Foote, as follows:

First—

Resolved, That the Board of Railway Commissioners of the State of California do hereby establish and adopt the following schedule of rates of charges for the transportation of passengers on the lines of railroad in this State, owned, leased, controlled, or operated by the Central Pacific Railroad Company or the Southern Pacific Railroad Company: 1. The rates for the transportation of passengers over the age of twelve years are hereby fixed and established at the sum of three cents per mile. 2. The rates for the transportation of passengers over the age of five and under the age of twelve years, are hereby fixed and established at the sum of one and one half cents per mile. *Provided*, that where any of such railroad companies have heretofore, by reason of competition, or for any other reason, reduced or fixed their rates for the transportation of passengers and their baggage, or for passengers only, at a sum equal to or less than the rates hereinbefore named, then in such cases said rates shall not be raised or increased.

QUESTIONS FOR THE RAILROAD COMPANIES.

Second—

Resolved, That the various railroad companies of this State are hereby requested, under oath, through their President or Secretary, to answer the following interrogations:

1. What has been the total cost of your road and equipments to date? If any company owns, operates, or controls more than one line of road, please state the cost of each separate line.
2. What were your gross earnings for the year 1882?
3. What were your operating expenses for the year 1882?
4. State the per cent of operating expenses as compared to gross earnings for each year since the road has been in operation.
5. What is the total value of all your property in this State at this time?
6. What was the total amount of taxes assessed against the road in this State during the past fiscal year? Please state assessed valuation in each county of this State, and, also, whether the taxes assessed have been paid.
7. Please furnish a schedule of the rates of fare and freight charged by you in this State.
8. How much of your gross earnings came from local passengers? How much from local freights?
9. What were your total expenses for salaries to employes for the year 1882? Please state the names, official designations, and salaries of every person in your employment in any capacity whatever, who receives as much or more than \$5,000 per annum.

Although introduced in advance of the research and reflection which would have been fatal to them, the evident insufficiency of these resolutions for any purpose was enough to preclude the dangerous experiment of their adoption. The first of them, taken as the best evidence of what it was intended to be, and of its own method and principle of reduction, or want of both, has no reference whatever to the law or the facts. Tested by the law which prescribes "orders," "decisions," and "schedules," it is neither in form nor substance what it purports to be, and is a mere nullity. Considered as a recommendation of arbitrary uniform rates, not based upon any relation or proportion of operating expenses or profits in the passenger and freight departments of any road, nor upon the cost of any service in either of them, it was as easily postulated before as after investigation. Regarding it, therefore, as a palpable mistake of legal requirements and essential principles, and adapting the second to its ostensible object, they were both superseded by a substitute intro-

duced on the fifth day of February, 1883, by Commissioner Carpenter, as follows:

BOARD OF RAILROAD COMMISSIONERS OF THE STATE OF CALIFORNIA.

In the matter of resolutions Nos. 2 and 3, introduced by W. W. Foote and now pending before the said Commissioners.

The investigations commenced by said resolutions and now on this day resumed by said Commissioners upon their own motion, without petition, complaint, or any evidence of record herein; and it appearing that said resolution No. 2 is, by its terms, confined to rates of charges for the transportation of passengers on the lines of railroad in this State owned, leased, controlled, or operated by the Central Pacific Railroad Company or the Southern Pacific Railroad Company; and it appearing to said Commissioners that this investigation and the evidence taken therein should relate to the general subject of fares and freights, and furnish a basis and a reason for the revision and reduction of both, upon any or all of the railroads or other transportation companies of this State; and it appearing that for such purpose the scope and requirement of said resolution No. 3 should be so enlarged and outlined that the power conferred by the Constitution and laws shall be duly and regularly exercised as therein prescribed: Now, therefore, as a substitute for said resolutions, it is ordered by said Board of Commissioners:

First—That they will proceed in accordance with the following provision of the Constitution: "To establish rates of charges for the transportation of passengers and freight by railroad or other transportation companies, and publish the same from time to time, with such changes as they may make; to examine the books, records, and papers of all railroad and other transportation companies, and for this purpose to issue subpoenas and all other necessary process."

Second—Having taken, examined, and considered the documentary and other evidence necessary to an intelligent and equitable revision and reduction of charges for fares and freights by railroads or other transportation companies of this State, they will prepare and, as required by the Statutes of 1880, Chapter 59, Section 11, "serve a printed schedule of such rates, and of any changes which may be made in such rates, upon the person, copartnership, company, or corporation affected thereby."

Third—To accomplish the practical purposes aforesaid with becoming order and dispatch, only such testimony, exhibit, or report shall be deemed relevant or material as tends, subject to the following rules and principles, to show: 1. The corporate name and principal place of business of any transportation company mentioned in Section 14, Chapter 59, Statutes of 1880; 2. The names, places of residence, and compensation of all officers and agents employed by or on behalf of such company in the business of transportation or in operating any railroad of such company; 3. The length and termini, character and equipments, stations and terminal facilities, capacity for freight and passenger service, rates of charges, through, local, and special, resources and financial condition, and general business of any such railroad, or feeder, and branches.

Fourth—The present and prospective value of any such road, feeders, or branch, as a source of income or means of earning it, to be estimated and determined as if for any other purpose; the cost of construction to be taken and considered as an element, but not as a conclusive criterion, of value.

Fifth—What should be deemed a reasonable profit on such value, and what rates of charges for fares and freights on such road, branch, or feeder, will pay the company owning and operating the same, cost and risk of service, interest on its bonded and floating debts, the sum of taxes paid, and such reasonable profit as aforesaid.

Sixth—The fair apportionment of such rates as aforesaid, with due regard to the relative cost of service, and such regulations as are usual and proper for railroad companies, to the passenger and freight departments respectively.

Seventh—The repairs and renewals, betterments and extensions, in this State, necessary to the safety, public use, or successful operation of any such road, feeder, or branch, and the nature, extent, probable cost, and subsidiary interest of all concerned therein.

Eighth—The rates of charges for all classes of fares and freights established, exacted, or received by any transportation company in this State, under special contracts, private instructions, or published schedules, and the reasons, rules, regulations, and classifications by which they are all and severally governed and enforced.

Ninth—It is also ordered that an attested copy of the following circular letter, No. 2, be forwarded by mail to the President, Secretary, or General Superintendent of each Railroad Company in the State:

CIRCULAR LETTER NO. 2 (SUBSTITUTED FOR NO. 1).

OFFICE OF THE BOARD OF RAILROAD COMMISSIONERS }
OF THE STATE OF CALIFORNIA. }

To —, Esq., of the — Company:

DEAR SIR: Having under consideration the rates of charges and methods of business in force in the passenger and freight departments of the transportation companies subject to your supervision in this State; and in the interest of all concerned desiring to make only such revision and changes of existing schedules, classifications, and rates of charges as upon examination and reflection we shall deem just and reasonable, we respectfully and urgently request that at your earliest convenience within twenty days, if you have not already done so, you

prepare and file in this office, verified statements and exhibits in answer to our first circular letter, to wit:

First—What has been the total cost of your road and equipments to date? If any company owns, operates, or controls more than one line of road, please state the cost of each separate line.

Second—What were your gross earnings for the year 1882?

Third—What were your operating expenses for the year 1882?

Fourth—State the per cent of operating expenses as compared to gross earnings for each year since the road has been in operation.

Fifth—What is the total value of all your property in this State at this time?

Sixth—What was the total amount of taxes assessed against the road in this State during the past fiscal year? Please state assessed valuation in each county of this State, and, also, whether the taxes assessed have been paid.

Seventh—Please furnish a schedule of the rates of fare and freight charged by you in this State.

Eighth—How much of your gross earnings came from local passengers? How much from local freights?

Ninth—What were your total expenses for salaries to employes for the year 1882? Please state the names, official designations, and salaries of every person in your employment, in any capacity whatever, who receives as much or more than \$5,000 per annum.

Tenth—What amount of money do you pay as rent for each of your leased lines? Please state the rent per mile, as well as the gross sum for each line.

In addition to the information heretofore requested of you, we desire further statements and exhibits showing:

First—The name and principal place of business of your railroad company.

Second—A general description of the line or system of railroads it owns and operates.

Third—The same of the road or roads within this State.

Fourth—The inter-State connections of the overland roads, and their local relations to each other and to their respective feeders and branches.

Fifth—The reasons, if any, for differential rates on a system of coöperating roads.

Sixth—The extent to which such feeders and branches are dependent for continued existence and operation upon the trade and travel tributary to each.

Seventh—The ways and means for repairs, renewals, betterments, and extensions necessary to the safety, public use, and continued operation of such feeders and branches, or any of them.

Eighth—For what section and what proportion of the population and productions of the State is your road, or system of roads, the only means of transportation?

Ninth—At what points along its main line within this State does it meet with rival carriers by rail, river, or ocean, and for what percentage of its gross earnings does it compete with them?

Tenth—The alleged special contracts, or underbidding system of contracts, at such competitive point or points, under which your company performs stipulated service for contracting shippers on terms not open to all rival shippers and carriers.

Eleventh—State the average difference, if any, between contract and competitive rates for equivalent service at such points. A sample copy of such contract is requested.

Twelfth—Approximate the average difference between such special rates at such points, and schedule rates at non-competitive points?

Thirteenth—From a comparative estimate, what are the relative average rates of through and local freights?

Fourteenth—When and why are both collected, if at all, on through shipments to and from non-competitive points?

Fifteenth—What is the total income for the year ending December 31, 1882, of your road in California, from local freights on through shipments.

Sixteenth—What share of joint earnings from through freights prorated with its overland connections is received by your road in California?

Seventeenth—What, for the year last mentioned, were its total earnings from freights of all classes?

Eighteenth—What for the same year were its total operating expenses in freight department?

Nineteenth—How far does the relative cost of service in the freight and passenger departments of your road control the rates of charges for fares and freights?

Twentieth—What are the maximum and minimum and average rates of fare per mile for through passengers on your road in this State?

Twenty-first—The same for local passengers, excluding fares of Oakland Ferry?

Twenty-second—What is the percentage of expenses to earnings from each class of passengers, and percentage of net income from each to total operating expenses incurred for both?

Twenty-third—Percentage of expenses to earnings in passenger department?

Twenty-fourth—Percentage of expenses to earnings in freight department?

Twenty-fifth—Percentage of total expenses to total earnings in both departments?

Twenty-sixth—Percentage of net income in each to total net earnings in both?

You are also invited, by counsel or otherwise, to submit to our consideration such other facts and principles relative to the management and operation of your road as you may deem of interest to your company or the public.

Very respectfully,

For the substitute, Commissioners Humphreys and Carpenter, and against it Commissioner Foote. It was, therefore, duly adopted and passed, and the first instructive response thereto will be found in Appendix A. As the first effort of the Commission to outline for itself a legal method and course of inquiry and action, it may be improved but not successfully assailed. The valuable accumulation of reliable facts and statistics in which it has resulted has enabled the Commission to inaugurate a safe, steady, and forward movement in the confidence and strength of that intelligent conservatism which is progress in the right direction.

The following Amended Rules of Procedure were introduced by Commissioner Carpenter on the nineteenth, and unanimously adopted on the twenty-sixth of February, 1883. They define the functions of the Commission, simplify the pleadings, restrict the evidence and determination, to the parties and the issues in the case, and subject only to the statute, abolish dilatory proceedings, and deny rehearings in cases decided, except upon the record within ten days thereafter :

AMENDED RULES OF PROCEDURE OF THE BOARD OF RAILROAD COMMISSIONERS OF THE STATE OF CALIFORNIA.

[Adopted February 26, A. D. 1883.]

RULE I.—To regulate, establish, or change the rates of charges and schedules of fares or freights of any transportation company in this State, said Commissioners will proceed upon their own motion, or upon the complaint of any person or persons demanding relief, and having an interest therein.

RULE II.—In any case of alleged extortion, discrimination, or other abuse, by any transportation company in this State, subject to the cognizance and control of said Commissioners, they will proceed, upon the complaint of the person or persons injured thereby, to hear and determine the cause of such complaint, and will exercise the remedial and judicial powers conferred by the Constitution, as required thereby, to wit: "In the same manner and to the same extent as Courts of record, and to enforce their decisions and correct abuses through the medium of the Courts."

RULE III.—Such complaint as aforesaid, when presented at the office of said Commissioners, shall be filed by the Secretary, who shall, at the request of the complainant, issue a summons thereon.

RULE IV.—The summons must be directed to the defendant, must be signed by the Secretary, and attested by the seal of the Commissioners, and must contain :

1. The names of the parties to the proceeding.
2. A statement of the nature of the complaint.
3. A direction that the defendant appear and answer it within fifteen days after service thereof.

RULE V.—The summons may be served by the Bailiff of the Commissioners, or by any citizen of the State, and shall be served by delivering a copy thereof, together with a copy of the complaint, to the defendant, or if the defendant is a corporation, to the President, Secretary, Treasurer, or Managing Agent thereof. Proof of service of summons and complaint must be as follows :

1. If made by the Bailiff, his certificate thereof.
2. If by any other person, his affidavit thereof.

RULE VI.—From the time of the service of the summons and the copy of complaint, the Commissioners shall be deemed to have acquired jurisdiction of the parties and subject-matter. The voluntary appearance of the defendant is equivalent to personal service.

RULE VII.—The complaint must contain :

1. The names of the parties to the proceeding.
2. A statement of the cause of complaint, in ordinary and concise language, giving such particulars of time, place, and circumstances as may enable the defendant to answer the same intelligently.
3. A demand of the relief claimed.

RULE VIII.—The defendant may, within the time required in the summons to answer, object to the complaint upon the following grounds :

1. That it does not state facts sufficient to authorize the proceedings.
2. That it does not conform to the requirements of Sec. 9, Chapter 59, Statutes of 1880.

RULE IX.—If the objection be sustained, the complainant may amend his complaint. If the objection be overruled, the defendant may answer the complaint.

RULE X.—The answer of the defendant may contain :

1. A general or specific denial of the allegations of the complaint controverted by him.

2. A statement of any new matter of defense, or in mitigation or explanation of the charges made in the complaint.

RULE XI.—The complainant may, upon service of the answer, object to the same as insufficient, and if the objection is sustained the defendant may amend his answer.

RULE XII.—The complaint, answer, and demurrer must be subscribed by the party, his authorized agent or attorney. The complaint and answer must be verified as required by the Code of Civil Procedure in civil cases.

RULE XIII.—Upon the appearance, answer, or default of defendant, the Commissioners shall promptly hear and determine the cause of complaint, and upon the law and the facts shall render and file in their office a decision in writing, signed by the Commissioners concurring therein. Within ten days thereafter, upon a petition by either party based upon the record in the case, such decision may be modified or changed by order of the Commissioners, setting forth the reasons therefor.

RULE XIV.—The Secretary of the Commissioners must keep a calendar of cases pending before them, in their chronological order; and in a suitable book, properly indexed, shall enter all orders and decisions of the Board.

RULE XV.—The provisions of Part IV of the Code of Civil Procedure, relating to the general principles, kinds and degrees, production and effect of evidence, and of the rights and duties of witnesses, shall be applicable to proceedings before these Commissioners.

RULE XVI.—These rules may be amended at any regular meeting of the Commissioners, and amendments so made shall go into effect in ten days thereafter.

RULE XVII.—These rules shall be in force from and after the first day of March, 1883.

The cases to which the foregoing rules mainly apply, are those of individuals against railroad companies for alleged overcharges, discriminations, or other abuses within the jurisdiction of the Commission. When by letter or otherwise, its interposition has been invoked for the correction of these special grievances, they have been referred in the first instance for information or adjustment to the responsible company. Thus, in some cases, it has been found that there had been a mistake of facts, or of rules and regulations usual and proper in the premises; and, in others, the causes of dispute have been promptly adjusted to the satisfaction of all concerned. In but three cases have verified complaints been filed under and in accordance with the statute and rules of procedure. Two of these, namely: *Palmtag and Bernhardt vs. The Southern Pacific Railroad Company*, and *W. H. Robinson vs. The Central Pacific Railroad Company*, are pending upon issues of law, not yet argued or submitted. The first on the calendar is the case of *Richards & Harrison vs. The Central Pacific Railroad Company*, which was commenced on the sixth day of February, 1883, and on the twenty-sixth day of February, 1883, was argued, submitted, and taken under advisement. On the twenty-ninth day of May, by reason of the law and the facts, fully and carefully considered, with due regard to the parties and the issues, the case was finally decided against the complainants. And holding, as the Commission does, that the long and patient trial of the case was properly before and not after judgment, it submits without irrelevant gloss or comment, the majority opinion of Commissioner Carpenter, specially concurred in by Commissioner Humphreys, and also the dissenting opinion of Commissioner Foote.

TEXT OF OPINION BY G. J. CARPENTER.

Richards & Harrison, Plaintiffs, vs. The Central Pacific Railroad Company, Defendant.

This cause is the first of its class on the calendar of this Commission. It has a history which has been kept prominently before us, and much of which has served only as an intruding element of confusion. We are thus reminded that it has been the subject of inconsequential private interviews between the parties, and of acrimonious partisan agitation, not at all conducive to an impartial consideration of the law or the facts. And we make this reference to what preceded our cognizance of the case, only to say that no political or other organization is a party thereto, or can dictate or influence a word of our decision. Dispassionately and rigidly excluding from consideration the motives and incidents of a controversy neither relevant nor

material to the issues we are to decide, and confining our findings and decision to the real issues in the case, as it has been made and submitted by the parties, neither of them will be helped or harmed by anything not properly involved therein.

THE PLEADINGS SUMMARIZED—COMPLAINT.

In substance and effect, complainants allege in a verified complaint that they have been subjected by the defendant to a "special contract extortion equal to about fifty dollars per carload in excess of any other importers in the same line of imports." That "being the most extensive importers of certain classes of goods," they were subjected to such overcharge because of their declining to sign the obnoxious document, which had been signed by "all other importers in the same line of imports." That complaint was made to the freight agent of defendant, "stating that owing to the miscellaneous nature of this firm's trade they could not sign a special freight contract," and also asserting their "right to import goods from certain constituencies by sea," for the reason that they could not "bear the burden of rail charges." That being denied contract rates upon their shipments of bottled beer from the City of Milwaukee, Wisconsin, they shipped by rail and water via New York and Cape Horn for about two years. That thereupon the Milwaukee "shippers" were threatened that if they shipped any more goods around the Horn to Richards & Harrison, their manufactures would be by discrimination denied admission to Montana, Idaho, and all markets along the line." That complainants called on the directory of the road but to find that no justice or satisfaction could be obtained, and having "sufficient foreign constituencies," they were enabled to defy and "free to expose the existing tyrannies." That to make a test case they instituted a protest against the mentioned "extortion and overcharges," and also against the portion of such charges as had been advanced for said complainants by defendant to its "connecting roads." That the Central Pacific Railroad Company nevertheless carried out their threat and have since notified all connecting roads not to carry Richards & Harrison's freight unless paid in advance. This is a full and accurate statement of such issues as are tendered by the complaint. In the absence of its averment, we take official notice of the jurisdictional fact that defendant owns and operates a railroad within this State, and is therefore a common carrier and subject to our cognizance.

ANSWER OF DEFENDANT.

Defendant accepts such issues as are tendered by complaint, and denies that because they "declined to sign the obnoxious document," they have been subjected to the alleged extortion or any overcharge. Admits that they have paid defendant its proportion of open tariff rates on west bound freight, but avers that while doing so they had the offer of the same reduced rates upon the same conditions as all the persons receiving such freight at San Francisco. That such offer was subject only to the terms of what are known as special contracts, which are at the option of all shippers at said city. Denies the alleged threat and discrimination against the Milwaukee or other shippers, or their manufactures, or to exclude them from Montana, Idaho, or other place or market. Admits that one of the complainants called on the general freight agent of the defendant, but denies that "no justice or satisfaction could be obtained," sets up the interview with what was said and done thereat as a part of the answer. It appears therefrom, as an undisputed averment, that the only justice or satisfaction which complainants proposed and were willing to accept, and cease their opposition political and otherwise, was a contract by defendant, to protect them against Vining, and to give them the lowest rates, upon terms of their own which they required to be put in writing, "for four years, three months before the next election." Defendant admits that it decline to make such special terms in favor of complainants, or to advance or collect freight charges for their account due to connecting carriers. That of the through rate from Milwaukee to San Francisco, of two dollars and twenty-five cents per hundred pounds, the proportion earned and received by defendant is eighty-eight and seventy-two one hundredths cents, which it collects on delivery of freight to complainants at the City of San Francisco.

PROVISIONS OF THE CONSTITUTION CONFERRING AND LIMITING THE POWERS OF THE COMMISSION.

Of extortion and discrimination by railroad and other transportation companies in this State, the remedial jurisdiction of this Commission is concurrent with, and subsidiary to, that of the Courts. It is conferred upon the Commission by the Constitution, Article 12, Section 22, as follows: "Said Commissioners shall have the power, and it shall be their duty * * * to hear complaints against railroad and other transportation companies, to send for persons and papers, to administer oaths, take testimony, and punish for contempt of their orders and processes in the same manner and to the same extent as Courts of record, and enforce their decisions and correct abuses through the medium of the Courts." It is reserved and continued in the Courts as follows: "Nothing in this section shall prevent individuals from maintaining actions against any of such companies."

STATUTORY PROVISIONS AND MODE OF PROCEDURE.

An Act to define the powers of the Board of Railroad Commissioners, approved April 15, 1880, creates the offices and prescribes the duties of Secretary and Bailiff, provides for seal and

authentication of process, that it may be "issued in like manner as by Courts of record," "shall extend to all parts of the State," may be served by Bailiff or "any person authorized to serve process of Courts of record," who shall make return of the same.

It also enacts as follows: SEC. 9. "All complaints before said Board shall be in writing and under oath. All decisions of said Board shall be given in writing and the grounds of the decisions shall be stated. A record of the proceedings of said Board shall be kept, and the evidence of persons appearing before said Board shall be preserved."

SEC. 10. "Whenever the Board shall render a decision within the purview and pursuant to the authority vested in the Board by Section 22, Article 12, of the Constitution, said Board, or the person, copartnership, company, or corporation making the complaint upon which such decision was rendered, is authorized to sue upon such decision in any Court of competent jurisdiction in this State."

The Constitution and laws must be regularly and strictly pursued.

Besides the foregoing headlights, there are many decisions of Courts and Railroad Commissions relating to the jurisdiction and functions of similar bodies in analogous cases. And it is to make this case, if only to that extent, a precedent in others of its class, that we have taken from the Constitution and laws of the State the measure of our authority and the mode of its exercise. And whether the Commission is more a Board of Arbitration than a Court, or a cross between them, is, perhaps, not very important. For however, in either capacity, we may relax judicial rules of pleading and evidence, as we have done even to looseness in this case, it is only by due process of law that we can obtain jurisdiction of parties or subject-matter or render a valid decision. Without such process our award as arbitrators would be *nullum arbitrium*, and our order or decision, whatever its official rank, a new cause of mutual misunderstanding. The supposition, therefore, that this Commission belongs to no department of the Government, and is subject to no legal limitations, that it may substitute equity for law, and arbitrary discretion for both, can only serve to defeat its legitimate purposes, and should never control its action. It is nevertheless true that like the Courts, although not one of them, it has a law and an equity side, equally and easily accessible. But equity follows the law, and this Commission, were it a Court of Chancery, should follow it also. (Cohn vs. Barrett, 5 Cal. 195. Winter vs. Fitzpatrick, 35 Cal., 369. Gray vs. Hawes, 8 Cal. 562. Chester vs. Connecticut, etc., R. R. Co., 41 Conn. 348. People vs. Dutchess, etc., R. R. Co., 58 N. Y. 152. Boston and Worcester R. R. Co. vs. Western R. R. Co., 14 Gray, 253.)

DEFENDANT AND ITS CO-OPERATING ROADS NOT PARTNERS INTER SE OR AS TO THIRD PARTIES.

The defendant is expressly authorized by the Constitution, to connect at the "State lines with railroads of other States."

"Art. 12, Sec. 17. It cannot 'combine or make any contract with the owners of any vessel that leaves port, or makes port in this State,' by which combination or contract, the earnings of one doing the carrying are to be shared by the other not doing the carrying." In these provisions are clearly implied the limits of our control, and the legality of any connection, combination, or contract between the defendant and other common carriers designated, whereby the earnings of all are to be shared by each in the proportion of its separate service. And such substantially, as shown by the record in this case, is the connection and combination of the defendant with the companies making the alleged overcharges for services, as per bill of lading on file herein.

Their relations to each other, therefore, whether dictated by considerations of individual self-interest, or the reciprocities of mutual advantage, have the sanction of law. They are, moreover, those of coöperating carriers, respectively owning and operating their several roads, under separate management, and sharing earnings in the proportion of their separate service; and are not those of partners *inter se*, or as to third parties. (Montgomery, etc., R. R. Co. vs. Moore, 51 Ala. 394. Ellsworth vs. Fratt, 26 Ala. 733. Pattison vs. Blanchard, 1 Seld. 186. Converse vs. Norrich, etc., Trans. Co., 33 Conn. 166. Gass vs. The Railroad, 99 Mass. 220.)

RELATIONS OF INTERSECTING RAILROADS PRESCRIBED BY ACTS OF CONGRESS, JUDICIALLY CONSTRUED.

Beyond the limits of the State the connection and use in continuous lines of railroads under separate ownership and management, are authorized and required by the Federal Government. By an Act of Congress (U. S. Rev. Stat., Sec. 525, p. 1012), "other railroad companies are authorized to connect their roads with the Union Pacific Railroad, or any of its branches." By the enlarging Act of June 15, 1866 (U. S. Stat., Sec. 5258), it is provided that every railroad company in the United States * * * is hereby authorized to carry upon and over its road, boats, bridges, and ferries, all passengers, troops, government supplies, mails, freight, and property, on their way from one State to another State, and to receive compensation therefor, and to connect with roads from other States so as to form continuous lines for the transportation of the same to the place of destination." In Council Bluffs vs. Kansas, St. Joseph and Council Bluffs Railroad Company, 45 Iowa, 338, the Court, by Miller, J., said: "It was intended that the cars themselves, with their burdens, should be transported from one road to another, so that passengers and freight might be transported from ocean to ocean without change of cars, or breaking bulk, as upon one continuous line." (See, also, to the same effect, Railroad Company vs. Richmond, 19 Wall. 584.) Thus, while no presumption of partnership or joint liability arises from such connection and operation, the obligations inferred therefrom by complainants would make all the

intersecting railroad companies in the United States their agents to pay advances on freight transferred from one to another, and would render them jointly liable for a breach of such duty. Upon this theory any company, by its special contract, could bind its connecting lines.

THROUGH RATES CONTRACTED BY BILL OF LADING.

To avoid such a conclusion, it is urged in argument by complainants, that while we have no power to relieve them against the alleged overcharge, nevertheless so much thereof as was received by the defendant is subject to our order. The point presupposes some proof of extortion, which we need not consider here, and also ignores the entirety of the contract as to rates between the contracting carrier and complainants. From the bill of lading in evidence, it appears that Voechting, Shape & Co., of Milwaukee, Wisconsin, are the consignors, Richards & Harrison, the consignees, and the Chicago, Milwaukee and St. Paul Railway Company, by its through fast freight line, was the receiving and contracting carrier of the bottled beer which is the subject of the consignment. There is in it the clause following: "This bill of lading contracts rates from Milwaukee, Wisconsin, to San Francisco, Cal., via U. P. Ry."

THE LAW APPLIED TO THE FACTS.

The only special contract in this case, to which complainants and defendant are parties, is the bill of lading in evidence, which contracts rates from Milwaukee, Wisconsin, to San Francisco, at two dollars and twenty-five cents per hundred pounds for the whole distance. It is the sum of these through rates in excess of two dollars per hundred pounds, which is alleged to be an overcharge of about fifty dollars per carload. And to make this a test case complainant protested against the through charges, including the portion thereof received by defendant on three consignments. It was because complainants protested against the payment of advances made for them by defendant to its connecting carriers that it finally notified them that no further advances would be made. Of its right to refuse accommodation advances, and also continued credit for its own share of the service, the Code is conclusive. It is as follows: "A common carrier is entitled to a reasonable compensation and no more, which he may require to be paid in advance. If payment thereof is refused he may refuse to carry." (Civil Code, Section 2173.)

This is only the codified rule of the common law, familiar to every man of business, and the same in every State in the Union. If, therefore, our decision were against defendant as to its share of the alleged overcharge, its connecting and contracting carriers might evade it with impunity by collecting through rates in advance. If, on the contrary, like the protests of complainants, it were aimed at the through charge, as per bill of lading in its entirety, it would be a nullity in three sovereign States and two Territories. And the Courts of the State in which the contract was made, and partly performed, would enforce it against resident shippers and carriers. (*McDaniel vs. Chicago, etc. Ry. Co.*, 24 Iowa, 412. *Brown vs. Camden, etc. R. R. Co.* 83 Pa. St. 316. *Milwaukee, etc., R. R. Co. vs. Smith*, 74 Ill. 197. *Baw Knight vs. Liverpool, etc., Ins. Co.*, 55 Ga. 194. *Lathrop vs. Union Pacific R. R. Co.*, 1 *McArthur*, 234.)

QUESTION OF JURISDICTION—ADJUDICATED CASES.

But a decision without jurisdiction of parties or subject-matter, bad and ineffective as it must necessarily be, would be still more impotent if in conflict with the jurisdiction of the Federal Government, which, to the extent that it has been exercised in making the road of defendant a continuation of all connecting lines for purposes of inter-State commerce, is exclusive of State supervision. (*Council Bluffs vs. Kansas, St. Joseph and Council Bluffs Railroad Company*, 45 Iowa, 339. *Crandall vs. State of Nevada*, 6 Wall. 35. *Gilman vs. Philadelphia*, 3 id. 713. *Cooley vs. The Board of Wardens*, 12 How. 399.)

While giving the benefit of every doubt to State rights, and believing that they should be resolutely exercised up to their constitutional limits, we can neither reverse nor resist the latest and most authoritative decisions of the Federal Courts. Their peculiar force in this case is found in the fact that it involves the construction of a contract relating to inter-State commerce and to the rights of non-resident parties, holding the relation to each other of connecting and coöperating carriers, by force and virtue of Congressional enactments and State recognition, and that the defendant itself is a resident of two States and one Territory. (U. S. Constitution, Art. 1, Sec. 8. *United States vs. Union Pacific Railroad*, 95 U. S. 79. *Railroad Company vs. Hanover*, 95 U. S. 465. *Hall vs. De Cuir*, and cases there cited, 95 U. S. 488.)

THE ALLEGED THREAT OF THE UNION PACIFIC RAILROAD COMPANY TO DISCRIMINATE AGAINST VOECHTING, SHAPE & CO., OF MILWAUKEE.

In view of these constitutional limitations as settled by the most liberal construction, it will not be assumed that the alleged "foreign constituency" of complainants are within them. Like the merchants of San Francisco, with one exception, they are strangers to this case. From none of them have we any complaint, other than that of Voechting, Shape & Co. It consists in an alleged threat of the Union Pacific Railroad Company, by its agent, Vining, to so discriminate against the beer of said firm as to exclude it from Montana, Idaho, and all markets along the line. It comes from their traveling agent, Annaka, to his principals at

Milwaukee, from them at second hand to Richards & Harrison, from them to Stubbs, and from Stubbs to us. After all its repetitions in this case and elsewhere, it is only hearsay, unverified by Anneka, and denied by Vining. Defendant denies that it ever executed or was a party to the threatened discrimination, and the evidence shows that at the time of the alleged threat, Stubbs, on behalf of defendant, was waging war against the offending Union Pacific Company to be let into Montana and Idaho. Besides, there is no evidence in the case showing that the alleged threat was ever made. It is neither plead nor proved that the threatened firm ever had a customer to lose, or any trade or market to suffer, or any rival to profit, by discrimination, actual or threatened. Its denial, therefore, by defendant, was superfluous, and we refer to it only to clear up the record in this case.

SPECIAL CONTRACTS CONSIDERED WITH REFERENCE TO CONTRACTING RAILROAD COMPANIES.

It is for this purpose that we must take some notice here of what are known as special contracts. In this case, our knowledge and jurisdiction of them, severally and as a system, rest upon a blank form, put in evidence by the defendant, from which it appears that the parties thereto of the first part are the Union Pacific Railway Company, the Atchison, Topeka and Santa Fé Railroad Company, the Missouri Pacific Railway Company, and the Galveston, Harrisburg and San Antonio Railway Company. Besides the contracting parties mentioned, more than thirty Eastern companies, owning and operating roads radiating in intersecting lines and systems from the Atlantic seaboard to points on and west of the meridian of Council Bluffs, Kansas City, and Galveston, are designated as subsidiary carriers of west-bound through freight at contract rates. As shown by the testimony of Messrs. Gray and Stubbs, earnings are prorated to roads performing service upon the basis of mileage, the greater cost of service on the Union and Central Pacific roads being admitted by the Eastern companies and compensated by constructive distance. As between the companies interested, the arrangement presented by the evidence is but a practical illustration of what is said in a standard work on railways, by Marshal M. Markman, page 289, as follows: "All vicissitudes of the traffic have to be considered in making the through rate. After the through rate has been determined upon, the proportion to be allotted to the several lines performing the service is of course a matter of agreement among them." In *Munhall vs. Pennsylvania Railroad Company* and *Allegheny Valley Railroad Company*, 92 Pa. St. No. 156, in a well considered opinion by one of the ablest Courts of this country, it is said: "These two companies had the right, either for their own convenience or for the convenience of the refiners and shippers, to require the whole freight on refined oil to be paid to the one that first carried it. The right of connecting railroad corporations to make contracts for through rates is incident to their powers, unless prohibited by their charters."

THEIR GENERAL POLICY AND THE RIGHTS OF CONTRACTING MERCHANTS NOT INVOLVED IN THE CASE.

It is in evidence, and not contradicted by any witness, that these foreign companies, in consultation with the agents of defendant, and with contracting merchants of San Francisco, make the rates and prescribe the special conditions of the all-rail service from the Atlantic seaboard to California. It is also shown by uncontradicted testimony, that subject to these conditions all shippers of west bound merchandise are equally favored, and that all in this city but complainants in their line of business, have availed themselves of the so called special contracts. These contracts can be annulled or rescinded only at the suit of those who have become parties thereto by "mistake, duress, menace, fraud, or undue influence," or as to whom there has been some breach of condition or failure of consideration. (Vide Civil Code, Section 1689.) But after the most ample opportunity to obtain it there is no evidence here that of all the merchants who have made such contracts, including Mr. Bach, who was a witness before us, any one of them desires to be released therefrom, or that any condition thereof shall be annulled, rescinded, or reformed.

In this connection, it must be remembered that the complainants are not here in the representative character of relators for the contracting shippers and merchants of San Francisco, whose loss of "liberty, manhood, and independent position as merchants," seems not to have been realized by themselves. And until they in person, or by some one competent to complain for them, shall assail their contracts, they will be presumed to be mutually satisfactory to the parties, and to bind the contracting companies. "A written agreement by a common carrier to transport merchandise for another, from one place to another, for a certain period at a fixed price, is a binding offer for that period." (*Harvey vs. Connecticut and Passumpsic Railroad*, 124 Mass. 421. *Wheeler vs. U. P. R. Co.*, 31 Cal. 46. 1 Redfield on Railways, Sec. 146.)

CONSTITUTIONAL AND JUDICIAL TESTS OF ALLEGED DISCRIMINATION.

Holding, therefore, that any order assuming jurisdiction of contracts between those not parties to this case, would be *dehors* the record and without due process or authority of law, there remains to be considered only the alleged extortions and discriminations. If, for the same service, under identical conditions, not open to complainants, they have paid higher rates than those exacted from others, they should recover the difference. To come within the prohibitory clauses of the Constitution, Article 12, Section 21, the discriminating charges must be for transportation of the same class of freight, and "property of the same class in the same

direction," to the same or a less distant destination. These essential tests of discrimination are the same at common law, and are recognized by all the decided cases. In the case of *John Hays & Co. vs. The Pennsylvania Railroad Company*, 12 Federal Reporter, 309, Circuit Court, N. D., Ohio, Baxter, C. J., so often quoted, and so much relied upon by complainants, the discrimination was by rebate in favor of the largest shippers of coal in the same direction and to the same market. It was based solely on the quantity, and left the smaller shippers no alternative but to pay the higher rate of charge for the same service. In *Messenger et al. vs. Pennsylvania Railroad Company*, 7 Brom. 410, it is held to be "discrimination to demand a different hire from different persons for an identical kind of service, under identical conditions;" * * * or "different rates for the carriage of goods of the same kind, between the same points." In *Brown vs. The Manchester, Sheffield, and Lincolnshire Railway Co.*, 6 English and American Railway Cases, 481, there was a higher rate without conditions, and a lower rate by special contract; conditioned upon the exemption of the defendant from liability as a common carrier; and because all shippers might "enter into similar agreements," and the "plaintiff had an alternative," the contract was sustained. Thus by the Constitution, and by all adjudicated cases, charges must be based upon the essential factors of the service—class and volume of freight, and direction and distance of transportation.

NO EVIDENCE OF DISCRIMINATION AS DEFINED BY LAW.

The criterion of discrimination being no longer debatable, the onus of bringing their case within it is upon the complainants. It is admitted that having the same option as others they have declined the condition of the lower, and paid the higher rate on their west bound freight from Milwaukee. Like Brown, in the leading English case, cited *supra*, they "had an alternative" and cannot complain of their choice. The reason therefor, assigned in their complaint, and also in their interview with Stubbs is, "that owing to the miscellaneous nature of this firm's imports they could not sign a special contract." Importations confessedly *vis generis* cannot belong to the "same class of freight" as those of the contracting merchants. This alone would be conclusive against the alleged discrimination, which can be shown only by comparison of charges for transportation of the same "class of freight." But besides this, we have looked through the one hundred and forty-five pages of printed evidence on file, and find them utterly barren of proof that any contracting or other merchant than complainants ever shipped from Milwaukee or any given point, one pound of freight of any class in any direction or for any distance. We find and hold, therefore, that complainants have failed in every essential particular to prove the discrimination alleged.

THE ALLEGED EXTORTION—TERM NOT FOUND IN THE CONSTITUTION—JUDICIALLY DEFINED TO BE MORE THAN REASONABLE HIRE.

Extortion is not defined nor is the term found in the Constitution. At common law, and by the Civil Code, a carrier of freight or passengers may charge a reasonable hire, more than which is extortion. Since the decision in *Bastard vs. Bastard*, 1 Show. 81, the Courts of England have uniformly held that, where there is no agreement as to price the carrier may have a *quantum meruit* for his hire. In *Citizens Bank vs. The Nantucket Steamboat Company*, 2 Story, 35, the Court defines reasonable hire "to mean a *quantum meruit*." This is the golden rule of measure for measure, and is the law of this country. And what the given service is reasonably worth is always, in the last resort, a question to be judicially decided, strictly between the parties. To say, in a case of alleged extortion, that the right of one is the right of all, is neither to define or demonstrate the right of any. Specific value of the service performed, and not what is charged another, is the question to be determined. In *Camblos vs. Philadelphia A. C. R. R. Co.*, 4 Brewster, 563, the Court say: "Statutory restrictions as to railroad companies' charges exclude questions of their reasonableness, except where rebates from the maximum or additions to a lower rate are unequal." In *Johnson vs. Pensacola and Perdido R. R. Co.*, 16 Fla., 623, it is said, "whether a charge made by A against B is reasonable, cannot be determined by establishing the charges against C for the same service. It is too plain for argument that the higher charge, where there is a difference, may be what is the compensatory sum; the lower charge may be too small for the service."

THE ALLEGED EXTORTION NOT PROVED.

However often asserted, extortion is not to be presumed. Has it been proved as alleged, or otherwise, in this case? It appears from the testimony of Messrs. Dempster and Bach that the higher and lower rates of transportation paid by their respective houses, are entirely optional. They testify to no rebate, unequal or otherwise, from the higher, nor to any addition to the lower rate, nor to any unfairness in the conditions of either. The higher, if subject thereto, is within the legal maximum in this State, and is not, therefore, extortion by construction of law. From end to end of the long record, no witness has testified, and there is no proof that any of the charges complained of is more than a *quantum meruit*, or has in it any element of extortion.

It is ordered, therefore, that the relief demanded by complainants in this proceeding be and the same is hereby denied, and that this decision be filed herein, without prejudice to any other remedy of said complainants, as the judgment of this Commission.

G. J. CARPENTER,
Commissioner First District.

Concurred in, for reasons given in a separate opinion, by—

WM. P. HUMPHREYS,
Commissioner Second District.

OPINION OF COMMISSIONER FOOTE.

Richards & Harrison, Plaintiffs, vs. The Central Pacific Railroad Company, Defendant.

The plaintiffs in this matter are merchants doing business in the City and County of San Francisco, and the defendant is a corporation organized under the laws of the State of California, and operating lines of railroad in said State and elsewhere.

Plaintiffs complain that they have been discriminated against injuriously, by the corporation defendant, in that they have been charged, and compelled to pay, "open tariff rates" upon large shipments made by them of bottled beer from Milwaukee to San Francisco, whilst other parties, in the same line of business, have been charged less rates, over the same line of road, on the same articles, under what is known as the "special contract" system. The view which I take of this matter involves not only the question of discrimination against the firm named, but also the question as to the jurisdiction of this Board over the transportation companies of this State, and the general policy of the "special contract" system as it affects the whole shipping community.

The undisputed facts, as they appear in evidence, are: That the Central Pacific Railroad Company, together with certain Eastern railroad corporations, in order to meet the competition of clipper ships around Cape Horn, and the route by the Isthmus of Panama, as well as to increase their own business, had a general conference upon the subject of through freight shipments to California, the result of which was that certain rates were made for special contract shippers, different from those applied to others who did business with the railroad companies, under their general or open tariff rates.

It is true that the Central Pacific Railroad Company is not named as a party to the contract in the written agreement, but in the memorandum of special rates, which contains the schedule of rates to be applied to those having special contracts, they are named, and besides, it appears from the testimony, that the Central Pacific Railroad Company is a real party to these contracts, and beneficially interested in (the freight earnings under) them. The following quotations from the printed transcript of the evidence I think establish this fact:

Q. Do you recognize this special contract as the one now in force? (Handing contract to witness.) A. Yes, sir; that is the blank now in use.

Q. Has the Central Pacific Railroad Company any interest in that contract? A. Yes, sir; to the extent that they are interested in the rates named therein.

Q. Are they interested in the proceeds of freight collected under this contract? A. A portion of the freight.

Q. As a portion? A. A portion; yes, sir. (Page 7, Transcript.)

Q. What position does the Central Pacific hold with these contracts? A. It is a party to them in the same way that those roads not mentioned are a party to them. (Page 8, Transcript.)

Q. Have the Central Pacific no further interest in these contracts than as assumed agents? A. They have an interest in them to the extent of the earnings they receive under them. (Page 10, Transcript.)

Q. Now, are you or not interested to any extent in the amount of freight that is charged under that contract? You get a certain proportion of it, do you not? A. We get a certain proportion of it; yes, sir.

Q. And is not that an understanding which your company has with the other companies, which is not contained in the contract? A. Yes, sir.

Q. What is the proportion? What is your proportion of the contracts on through freight from here to New York under the special contract system?

By General Barnes: Q. Take the rate of \$2 25 on one hundred pounds of freight from Milwaukee or Chicago here. State how that is divided among the roads, and then you will get each one. A. Out of that rate the line between Milwaukee and Council Bluffs receives fifteen per cent. The bridge at Omaha receives five cents per one hundred pounds.

Q. Arbitrarily? A. Arbitrarily. Then the remainder is divided between the Union Pacific and the Central Pacific.

Q. According to what? A. On the basis of fifty-four per cent to the Union Pacific and forty-six per cent to the Central Pacific.

Mr. Foote: That is the same as passenger rates, is it not? A. That is the same as passenger rates; yes, sir.

Q. Then you have an understanding with them to that extent; you have an interest in the contract to the extent of forty-six per cent on the amount of freight between here and Omaha after crossing the bridge? A. Yes, sir. (Pages 13 and 14, Transcript.)

Q. Right there, do you or do you not have any understanding with the parties who are actually named in this contract, as to what proportion of the earnings your road shall receive, or is that contract made entirely by others? Do you take just what they agree to give you, or do you understand beforehand what you are to get? A. The division of our rates as between ourselves and the Union Pacific is all agreed beforehand; it is also agreed with the Iowa lines, as they are called; that is, the lines between the Missouri River and Chicago.

Q. Then, while you are not nominally parties to this contract, you have an interest in fixing the rates so far as your own road is concerned, have you not? A. We have interest in the earnings to the extent of the earnings. (Page 15, Transcript.)

Q. You have forty-six and they have fifty-four, as I understand you, of all freight money that is earned between the Missouri River and San Francisco? A. Yes, sir.

Q. That was understood before these contracts were entered into between you and the Union Pacific Railroad? A. Yes, sir.

Q: And to that extent, although not named as a party in the contract, you have an interest in making the contracts? A. Yes, sir.

Mr. Harrison: Mr. Gray, have you not a voice in making these rates of freight—what the rate shall be? A. These rates are established after consultation between all the roads forming the overland line.

Q. The Central Pacific included? A. Yes, sir.

Q. Therefore they have had a voice in making the rates? A. Yes, sir.

Q. Have they had a voice in making the terms and conditions of these contracts? A. They have agreed to the terms and conditions always.

Q. Have they had a voice in making them? A. To a certain extent, yes.

Q. To what extent? A. Well, in the handling of the business, the lines having the greater interest dictate.

Q. So you took what you could get? A. We submitted to the will of the majority.

Q. Did you ever protest against taking what you could get under those circumstances? A. I don't understand that question.

Q. Did you ever protest against any pro rata granted you by the line claiming the majority of the freight? A. The pro rata of what?

Q. Freight money; the Union Pacific is the one that claims the greater amount of freight. A. Those divisions were agreed on beforehand. (Page 16, Transcript.)

Q. Has there ever been an instance where that contract was signed and sent by the clerk to the office, who you say arranges that, which the other parties refused to sign. Isn't the simple signature of the merchant all that is required. Do not the other parties sign as a matter of course, when you send them on? A. There have been exceptions to the rule.

Q. For what reason, if you know? A. Well, the agent of the Union Pacific road would find out that the party was not signing in good faith, or was not competent to sign; that is, when agreeing to ship all his goods overland, either could not, or would not comply with the conditions.

Q. Do you know how they obtained that information; through whom? A. I do not. (Page 18, Transcript.)

Mr. Foote: I would like to ask a question or two. I understand you to say that your percentage of profit is eighty-four cents on the hundred pounds?

Gen. Barnes: Not the profit.

Mr. Foote: You charge that on the through rate? A. Yes, it is eighty-four cents.

Q. That would be \$168 a car from here to Ogden? A. Yes.

Q. The contract rate would be \$150; \$18 less? A. The contract rate would be \$400 from Milwaukee here.

Q. Your proportion of it? A. Just about \$150.

Q. I understand you to say you get eighty-four cents for one hundred pounds, and you can ten tons a carload? A. In other words, our proportion of the contract rate is \$18 a car lower than our proportion of the open rate.

Q. That is the way I figure it. I figure it on the basis of \$8 40 a ton from Ogden here? A. Yes, \$8 40 per thousand, or \$18 80.

Q. Then you say about nine cents is the difference between the contract rates and the others? A. Yes.

Q. That will be just \$18? A. Just about.

Q. So that it would be \$150? A. Yes.

Q. As a matter of fact there is only \$18 difference in profit to you on a carload?

General Barnes: It is not profit. It is what the freight charge is. Freight charge is on thing, profit another.

Mr. Foote: Exactly. It has been a little difficult to get at profit in the last few days. (Page 56, Transcript.)

The fact then that the Central Pacific Railroad Company is a real party to these contracts established by the evidence, and conceded by counsel for the defendant, for in his very able presentation of the case for the Transportation Company, on page 46 of his brief this language is used:

"It is in evidence, and admitted for that matter, that the Central Pacific Railroad Company though not a nominal party to these contracts, has acquiesced in them, approved of them, had a voice in the original determination of the rates, has made suggestions as to their modification and is interested in the results of the contracts to the extent of its proportion of the money agreed to be paid under them."

Upon the jurisdictional question, the learned counsel upon the same page of his brief, says

"It may well enough be conceded that until the State of Nevada and the Territory of Utah shall adopt some law for the control of freights and fares, and for general regulation upon this subject, of all railroads within their respective borders, the judgment or order of this Board of Railroad Commissioners may control the action of this California corporation in respect to freights and fares, with the details akin thereto, on its line without as well as within this State."

After making this concession, counsel strenuously argues against the jurisdiction of this Board to pass upon the questions involved in this case, and especially insists that it has no jurisdiction over foreign corporations who are parties to those special contracts. So far as for foreign corporations are concerned, it is an undoubted fact that the State of California cannot confer upon any tribunal extra territorial jurisdiction over foreign corporations, but so far as the Central Pacific Railroad is concerned I do not concur in the view he so ably presents.

The Constitution of this State, framed partly with a view to create a tribunal before which the transportation question could be fairly heard and determined, established a Board of Railroad Commissioners, and granted to it certain powers, and prescribed certain duties. Section 21, of Article 12, of the Constitution of the State of California, reads as follows: "Section 21. No discrimination in charges or facilities for transportation shall be made by any railroad or other transportation company between places or persons, or in the facilities for the transportation of the same classes of freight or passengers within this State, or coming from or going to any other State. Persons and property transported over any railroad, or by any other transportation company or individual, shall be delivered at any station, landing, or port, at charges not exceeding the charges for the transportation of persons and property of the same class, in the same direction, to any more distant station, port, or landing. Excursion and commutation tickets may be issued at special rates."

It is urged with great force that the charging of one person a certain rate, under a special contract, which is less than that charged to another for the same service, under open tariff rates, is not a discrimination within the meaning of the Constitution and laws, for the reason that all persons have the privilege of making special contracts if they so desire.

To my mind the evidence offered does not establish the fact that special contract rates are open to all alike, for Mr. Richard Gray, the General Freight Agent of the Central Pacific Road, in his evidence before this Board, to be found on page eighteen of the Transcript, uses this language:

"Q. Has there ever been an instance, where that contract was signed and sent on by the clerk in the office, who you say arranges that, where the other parties refused to sign? Isn't the simple signature of the merchant all that is required? A. There have been exceptions to the rule.

"Q. For what reason, if you know? A. Well, the agent of the Union Pacific Road would find out that the party either was not signing in good faith, or was not competent to sign; that is, while agreeing to ship all his goods overland, either could not or would not comply with the conditions.

"Q. Do you know how they obtained that information—through whom? A. I do not."

This testimony leads me to the conclusion that something more upon the part of the shipper than mere willingness to sign the contract is necessary, before the right to the contract attaches, and that is a determination upon the part of the railroad company upon the qualification of the party who seeks the privilege. My view, therefore, is that the railroad company can accept or reject a proposition for a special contract at its own discretion, and that, therefore, the special contract system is not equally open to all. The logical deduction from which is that the whole contract system is a discrimination, not only against these plaintiffs, but also against every other overland shipper, who does business under open tariff rates. If these views be correct, then there is no discretion vested in this Board as to what course should be pursued, for the constitutional mandate is plain: "No discrimination in charges or facilities for transportation shall be made by any railroad or other transportation company."

It is claimed by the railroad company that the general effect of the special contract system has been to greatly decrease the freight charges upon all classes of overland freight. However this may be, it is not for this Board to inquire, for if discrimination has been and is being practiced, it is our duty to prevent it. Undoubtedly those who ship under the lower rates are benefited to the extent of the reduction which is made, but how does it operate on those who for any reason are compelled to pay the higher rates? Doubtless to their disadvantage. That the SPECIAL CONTRACT SYSTEM was not devised for the benefit of the public, Mr. Stubbs' testimony amply proves. (Page 111, Transcript.) There are certain clauses in these SPECIAL CONTRACTS which, to say the least, are peculiar. In the first place, a shipper who signs one of these must agree to ship all his freight by rail. A failure to do so forfeits the privileges of the contract and obliges him to pay open tariff rates.

Secondly—No one who has a contract can buy from or sell to any one who ships in any other way than by rail under the same penalties. Thirdly—The railroad company reserves the right to examine the books of shippers in order to determine whether the terms of the contract are being faithfully complied with. A contract containing such provisions as these, in my judgment, offers a premium for fraud and perjury; it gives a dishonest shipper an undue advantage over one who will carry out the terms of the contract; its enforcement is against public policy, and in restraint of trade. It establishes a system of espionage over the mercantile community which no common carrier ought to be allowed to exercise under any circumstances.

Holding these views, it is scarcely necessary to add that in my judgment this Board ought to exercise all the powers conferred upon it to break up the system, to the end that every shipper in the State should have the privilege of conducting his business upon the basis of legitimate competition.

I have examined with great care all the authorities cited by counsel for defendant, besides other authorities to which I have had access, and they only confirm the views above expressed. There is no case reported, the facts of which are precisely the same as the one before this Board, but there are a number which throw light upon the subject.

The case of Hay vs. Pennsylvania Railroad Company, reported in 14 Federal Reporter, 309, which is the decision of Judge Baxter, of the United States Circuit Court, contains this language:

"Hence everybody constituting a part of the public for whose benefit it was authorized, is

entitled to an equal and impartial participation in the use of the facilities it is capable of affording. Its ownership by the corporation is in trust, as it were, for the public as well as for its shareholders, but its first and primary obligation is to the public. We need not recount all these obligations. It is enough for present purpose to say that the defendant has no right to make unreasonable and unjust discriminations. No rate can be formulated with sufficient flexibility to apply to every case that may arise. It may, however, be said that it is only when the discrimination inures to the undue advantage of one man in consequence of some injustice inflicted on another, that the law intervenes for the protection of the latter. * * * It is the custom, we believe, for railroad companies to carry fertilizers and machinery for mining and manufacturing purposes to be employed along the lines of their respective roads to develop the country and stimulate production, as a means of insuring a permanent increase of their business at lower rates than are charged on other classes of freight, because such discrimination, while it tends to advance the interest of all, works injustice to no one. * * * Ought a discrimination resting exclusively on such a basis to be sustained? If so, then the business of the country is in some degree subject to the will of railroad officials; for, if one man engaged in mining coal, and dependent on some railroad for transportation to the same market, can obtain transportation thereof at from twenty-five to thirty cents per ton less than another competing with him in business, solely on the ground that he is able to furnish and does furnish the larger quantity for shipment, the small operator will sooner or later be forced to abandon the unequal contest, and surrender to his more opulent rival. If the principle is sound in its application to rival parties engaged in mining coal, it is equally applicable to merchants, manufacturers, millers, dealers in lumber and grain, and to everybody else interested in any business requiring any considerable amount of transportation by rail, and it follows that the success of all such enterprises would depend as much on the favor of railroad officials as upon the energies and capacities of the parties prosecuting the same. It is not difficult with such a ruling to forecast the consequences. The men who control railroads would be quick to appreciate the power with which such a holding would invest them, and it may be, not slow to make the most of their opportunities, and perhaps tempted to favor their friends to the detriment of their personal or political opponents." The learned Judge, after commenting upon the facts, continues: "It is a discrimination in favor of capital, and is violative of a sound public policy; violative of that equality of right guaranteed to every citizen, and a wrong to the disfavored party, for which the Courts are competent to give redress."

The case of *Messenger vs. Pennsylvania Railroad Company*, reported 36 New Jersey, 407, holds these views:

"An agreement by a railroad company to carry goods for certain persons at a cheaper rate than they will carry under the same conditions for others, is void as creating an illegal preference. There is no doubt but an agreement of this kind is calculated to give an important advantage to one dealer over other dealers, and it is equally clear that, if the power to make the present engagement exists, many branches of business are at the mercy of these companies. A merchant who can transport his wares to market at a less cost than his rivals, will soon acquire, by underselling them, a practical monopoly of the business, and it is obvious that this result can be brought about if the rule is, as plaintiffs contend that it is, that these bargains giving preferences can be made. A railroad is not, in general, subject to much competition in the business between its termini; the difficulty in getting a charter, and the immense expense in building and equipping its road, leaves it in the main without a rival in the field of its operation, and the consequence is that the trader who can transmit his merchandise over it on terms more favorable than others can obtain, is in a fair way of ruling the market. The tendency of such compacts is adverse to the public welfare, which is materially dependent on commercial competition and the absence of monopolies. I am unable to see how it can be admissible for a common carrier to demand a different hire from various persons for an identical kind of service, under identical conditions. Such partiality is legitimate in private business, but how can it square with the obligations of public employment. A person having a public duty to discharge is undoubtedly bound to exercise such office for the equal benefit of all, and, therefore, to permit him to charge various prices, according to the person with whom he deals, for the same services, is to forget that he owes a duty to the community. If he exacts different rates for the carriage of goods of the same kind between the same points, he violates as plainly, though it may not be in the same degree, the principle of public policy, which, in his own despite, converts his business into a public employment."

A very recent case is that of *Rothschild vs. The Wabash, St. Louis and Pacific Railroad Company*, tried in one of the Nisi Prius Courts of Missouri, at St. Louis, and thus far only reported in the newspapers.

The case grew out of an alleged discrimination practiced against the plaintiff in the shipment of cattle from East St. Louis to Jersey City, under what is known, in railroad parlance, as the "Evener's system," and the following is a statement of the facts, and a portion of the opinion of the Court:

"In 1875 and 1877 plaintiff shipped various lots of cattle on the Toledo, Wabash and Western Railway Company, and Wabash, St. Louis and Pacific Railway Company, and complains that defendant charged him \$130 per car, whilst it carried cattle from and to the same points for Nelson Morris, of Chicago, and J. C. Eastman and S. W. Allentown, of New York City, for a less price, viz.: sixty dollars per car, thus enabling them to undersell him in the market at Jersey City, to his damage in the sum of \$25,000, for which he prays judgment." The following is a portion of Judge Adam's opinion:

"*Leopold Rothschild vs. The Wabash, St. Louis and Pacific Railway Company.*

"A railroad cannot be allowed to discriminate between patrons so as to charge one person a greater sum of money than it charges another for the same service, and when such discriminatory charges have been made and paid, the shipper paying the greater charge may recover from the railroad the surplus paid by him over and above what the railroad has charged at the same time and for the same service to any other shipper. The plaintiff did not prove that the charge made to him is unreasonably large, further than to show that it is larger than is charged to another for the same service. When this fact is shown, he makes a case of unlawful discrimination against himself, and may recover against the railroad the amount of the overcharge.

"The presumption is indulged that a railroad charges no shipper less than a reasonable price for services rendered. (*Hays vs. Penn. R. R.*, 22 Am. L. Reg. 39. *R. R. Co. vs. Steiner*, 9 Law and Eq. R. 39.)"

This case, in its facts, is more like those arising out of the "special contract" system than any other which has come under my observation. The judgment in this case was against the plaintiff, but solely, as the opinion shows, on account of the failures of proofs. In the present case the facts established are precisely those wherein the proof failed in the Missouri case. It is admitted here that the rates by carload lots, on the article of beer, are fifty dollars per carload higher under open rates than those which obtain under the special contract system, and that out of this sum the portion of freight money received by the Central Pacific Railroad is eighteen dollars per car. Counsel for defendant contends that this Board has no jurisdiction to pass upon this matter of special contracts, even so far as the Central Pacific Railroad is concerned. On page thirty-nine of his brief, he says: "These special contracts may be ever so void under the Constitution of this State, so far as the railroads of this State are concerned, because they are discriminative in character; but if the railroad company itself were to join hands to prevent their execution, both together, as each alone, would be powerless to prevent a single one of them to be made."

Again, on page forty-one, he says: "In other words, you have no more power over this subject-matter, or over the parties to the contract, than I have." Again, on page forty-six, he says: "I say, then, that this subject is not within the jurisdiction of this tribunal, and that its decrees, whatever they may be in respect of it, like the decrees of any other Court in respect to subject-matter or parties not within their jurisdiction, will be absolutely void."

These views are diametrically opposed to those which I entertain. I believe that this Board has jurisdiction of both parties to this proceeding; that the system is clearly a discrimination under our Constitution, and that this Board has ample power to enforce any decree it may make in the premises, whether pertaining to this particular case or the general subject of special contracts, under Section 12 of the Act of 1880, which reads as follows:

"SEC. 12. When jurisdiction is by the Constitution conferred on the Board of Railroad Commissioners, all the means necessary to carry it into effect are also conferred on said Board, and when in the exercise of jurisdiction within the purview of the authority conferred on said Board by the Constitution, the course of proceeding be not specially pointed out, any suitable process or mode of proceeding may be adopted by the Board which may appear most conformable to the spirit of the Constitution."

Entertaining these views, I think a decree should be made declaring that Richards & Harrison are entitled to recover from the Central Pacific Railroad Company all freight moneys which they have paid to defendant in excess of the special contract rates, and that such order or decree could be enforced under Section 22 of Article 12 of the Constitution, which gives to the Commissioners power to enforce their decisions and correct abuses through the medium of the Courts. Under the same statutory and constitutional provisions it seems that we have the power, and that it is our duty, to make and serve upon the Central Pacific Railroad Company a general order requiring that corporation to refrain from entering into further contracts and to carry for all shippers alike, for the lowest rates which are now charged to the most favored customers. This order could certainly be enforced under that further provision of Section 22 of Article 12 of the Constitution which provides a fine of \$2,000 for failure to conform to such rates as may be established by this Commission.

For the reasons herein stated, I dissent from the views expressed by my associates.

W. W. FOOTE,
Commissioner Third District.

At the same meeting (May twenty-ninth), Commissioner Foote introduced another resolution—his second relative to fares, and first relative to freights—as follows:

WHEREAS, The present Board of Railroad Commissioners have now been in office for nearly five months, and during said time have made no regulation reducing either freights or fares, or for the prevention of extortions or discriminations upon the part of any of the transportation companies of this State; and whereas, on the fifth day of February, A. D. 1883, a substitute for resolutions numbers two and three was passed by a majority of the Board, the purport of which was that investigation should precede action by this Board; and whereas, this Board has now investigated the subject of fares and freights upon certain lines of railroad in this State, the result of which investigation has been, to demonstrate that fares and freights upon said roads are too high, and that discriminations and extortions have been made, and are

now being practiced, which are prohibited by the Constitution, and should no longer be tolerated; therefore, be it

Resolved, First—That the judgment of this Board is: That upon the Central and Southern Pacific Railroads, and their leased lines, the maximum rate for passenger fares should not in any case exceed the sum of three cents per mile, and when said rates are now equal to or less than said sum per mile they should remain as they are now.

Second—That the present charges upon said lines of railroad, above mentioned, should be reduced at least twenty per cent from the freight rates in force on said roads on the first day of January, A. D. 1883.

Third—That all discriminations which are now practiced ought at once to be forbidden.

Fourth—That this Board proceed immediately to revise the tariffs of freights and fares upon the said lines of road, and serve copies of said revised schedules upon the corporations affected thereby, so that all of said contemplated reductions may go into operation on or before the first day of July, A. D. 1883.

On motion of Commissioner Carpenter, it was laid on the table, he and Commissioner Humphreys voting for, and Commissioner Foote against the motion. While the resolution is only an informal suggestion, without any official bearing, force, or purpose, it was made to the Commission itself at one of its public meetings, and is, therefore, inserted in this report. It is presented precisely as it is, and for all it is worth to the business or lawful methods of the office.

The whereases with which it is prefaced must be presumed to import the reasons for its introduction. The first, in a tone of self-reproach, confesses defaults which are not to be canceled by resolutions. The second informs the Commission of what the minutes are the best and most convenient evidence, and is therefore redundant and useless. The third recites that the Commission has "investigated," so as to "demonstrate" that fares and freights are "too high," but adds nothing to what it knows, or does not know. It says, also, that "discriminations and extortions" are now being practiced, which "are prohibited by the Constitution," and "should not be tolerated"—good reasons, in the opinion of the Commission, for instituting comparative statements, based upon existing classifications and charges, to determine definitely and specifically what rates are unequal, or *how much* "too high," and for adjustments and reductions according to law, but not for the resolution.

Following the foregoing recitals, the first subdivision of the resolution again suggests that over a system of long and short roads, presenting every vicissitude and variation of service known to railroading, there should be an even, unvarying, and uniform passenger rate of three cents per mile; provided, only, that rates now ranging below it, shall remain as they are. It thus refutes itself by establishing and continuing maximums and minimums, necessarily based upon differing conditions of the service.

The second subdivision suggests a like arbitrary uniform reduction of twenty per cent on freight rates, which would leave them relatively the same, and perpetuate the inequalities "prohibited by the Constitution." And this result is not prevented by the third subdivision, which disposes of discriminations by merely saying that they "ought at once to be forbidden." To *forbid* is easy enough, but to *prevent* necessitates long and tedious comparisons and equations of the discriminative rates. The fourth and last subdivision confesses its own insufficiency, by suggesting "*revised schedules*," instead of *another resolution*. But this intimation is manifestly superfluous, and comes too late to be of any service to the Commission. From the beginning it has repudiated resolutions like the one under consideration, as mere indulgences of evils which "ought to be no longer tolerated." And,

this constitutional infirmity of Commissioner Foote's first resolution was made apparent and conclusive by the substitute therefor, introduced by Commissioner Carpenter, and adopted by the Commission February 5, 1883, and which will be found on pages fourteen and fifteen of this report.

The first schedule was prepared under the direction of Commissioner Humphreys, and it was introduced by him for consideration on the first day of June, 1883. In tabulated form it established maximum rates of passenger fares within the State, on the roads owned and operated by the Central Pacific Railroad Company, at five and seven cents per mile. Thereafter, on the eleventh day of June, Commissioner Foote introduced a defective substitute for said schedule, showing the distance between stations and the price of a ticket from any given station to the next, but leaving it, if to any more distant point, to be ascertained by computation upon the uniform basis of three cents per mile. It was *not*, therefore, in the established and convenient form which shows not only the rate multiplied by the distance from one station to the next and from that to the next, to the end of the line, but from each to all and from all to each, over the entire road. But for the purpose of a vote upon the unreasonable uniform maximum rate of three cents per mile, over all roads, without regard to cost or conditions of service, it was treated as a schedule.

No definite action was taken on the two propositions thus before the Commission until the twenty-sixth of June, when both were withdrawn. Thereupon, by mutual understanding, Commissioner Humphreys introduced and moved the adoption of a new and more perfect schedule, together with an order for its enforcement, establishing maximums of passenger fares on said roads at four and six cents per mile. As a substitute therefor, Commissioner Foote moved the adoption of the schedule he had withdrawn. He voted for, and Commissioners Humphreys and Carpenter against, the motion. He then moved to amend the pending schedule by substituting therein three and four for the four and six-cent maximums it established. He voted for, and Humphreys and Carpenter against, the motion. Thereupon the motion to adopt said schedule and order reducing all higher rates to four and six cents per mile, and providing that rates ranging below them shall remain as they now are, was put and carried. Commissioners Humphreys and Carpenter voted for, and Commissioner Foote against, the motion.

In pursuance of law and the order of the Commission, the schedule thus adopted was printed, and on the second day of August was duly served on the companies to be affected thereby. Adopting and continuing all existing rates below four cents per mile, it establishes the lower of the reduced maximums over twelve hundred and ninety-five, and the higher over seven hundred and twenty-four, in all two thousand and nineteen miles of railroad, and their valley, mountain, and desert divisions, as follows:

	No. Miles.	Cents per Milo.
From San Francisco to Tracy	72	4
From San Francisco to Sacramento	151	4
From Niles to San José	18	4
From Lathrop to Sumner	220	4
From Sumner to San Fernando	147	6
From San Fernando to Los Angeles	21	4
From Los Angeles to Colton	58	4
From Colton to Yuma	191	6
From Mojave to Goffs	240	6
From Los Angeles to Santa Monica	18	4
From Los Angeles to Santa Ana	34	4
From Los Angeles to San Pedro	25	4
From Port Costa to Sacramento	58	4
From Stockton to Milton	30	4
From Peters to Oakdale	18	4
From Galt to Ione	27	4
From Davis to Knights Landing	19	4
From Woodland to Tehama	102	4
From Sacramento to Auburn	36	4
From Auburn to State Line	103	6
From Roseville to Redding	152	4
From Sacramento to Shingle	48	6
From South Vallejo to Calistoga	42	4
From Napa Junction to Suisun	13	4
From San Francisco to Monterey	125	4
From Carnadero to Tres Pinos	18	4
From Castroville to Soledad	33	4

The reduced maximums were put in operation on the nineteenth day of August, and superseded rates ranging up to ten cents per mile. The comparative mileage of different rates on all the roads affected thereby is as follows: On seven hundred and twenty-four miles, six cents; on eight hundred and eighty, four cents; on two hundred and sixty-four, less than four and more than three cents; and on one hundred and fifty-one, less than three cents per mile. The schedule and order of the Commission adopt the lowest existing rates on four hundred and fifteen miles of road, and establish reduced rates, making an average reduction of more than thirty per centum on the rates superseded, over and upon sixteen hundred and four miles of road.

The companies subject to the order of the Commission submitted to its enforcement under the formal protest which accompanies this report as Appendix B. It was made by A. N. Towne, their General Manager, and excepts:

First—To the jurisdiction of the Commission to “regulate fares and freights upon the Central and Southern Pacific Railroads.” The theory of the exception is, that by the several Acts of Congress to aid the construction of said roads, all power to regulate their charges for transportation, inter-State or local, not conferred upon their Directors, was reserved, with the assent of the State, by the Federal Government. It is also urged that the exercise of the power thus conferred over the Central Pacific Railroad is contingent upon an income of ten per cent upon the cost of its construction, exclusive of payments upon loans due to the Government. It is further maintained on behalf of the protesting company, that it is protected by said Acts from any law of any State or Territory by which it might be impeded, delayed, or prevented from performing its obligations to the Federal Government.

Having exercised the disputed power, the Commission finds in the Constitution of the State a defense which it need not defend. And, as any response to a denial of its authority may be superfluous, it will only suggest that Congress could reserve or confer only such powers as it had, and that they were and are limited to the regulation of inter-State commerce. To this the stipulated service to be performed by the protesting companies clearly belongs. To their acceptance of the loans and franchises, necessary to the performance of that service, and to their resulting obligations to the Federal Government, the State has assented, and can do nothing to defeat them. But it could not apprentice the complaining corporations to another State, nor to the United States, nor subordinate its local jurisdiction over them to any power or government external to itself.

The Acts of Congress relied upon by the protestant, if construed with reference to the visible boundaries of Federal power, are plainly enough within them, and the ratifying act of this State, so far from being a surrender, was an exercise of sovereignty in aid of overland roads for both local and national purposes. In short, the relations of the State and Federal Governments to an overland road are much like those of the connecting but separate steamship companies to the man who sold their tickets. In the case of *Biggs vs. Vanderbilt and Drew* (19 Barb. 222), they are held to have had the "same agent, but he acted in his vicarious capacity for each."

Second—The protesting companies deny that reductions made by the Commission from preëxisting standards, established by themselves, are just and reasonable. The theory of this objection has been fully considered and answered, and those who would draw conclusions from known results, must wait for them. In the meantime there are better reasons for other reductions than for any reaction to former rates.

Third—The protestants "insist" that the judgment and determination of the Commission in the premises must have been influenced, if not induced, by hostile surroundings. To all this and more, the Commission and each member thereof, enters an unqualified disclaimer and denial. And with the emphatic assurance that no official act or opinion of either has been or ever will be at all influenced by any threat or fear of railroad injunction, partisan mandamus, or personal injury, the subject is dismissed.

Fourth—The last and most serious objection to the action of the Commission is, that it will discourage and prevent the extension and construction of railroads, and will thus arrest the progress and prosperity of the State. It is suggestive of more than is said. It very clearly implies that the public use of railroads, which is the subject of regulation, is the sole inducement to their construction and operation. Precisely upon this implication rests the conclusion that the use of existing roads should be regulated upon such principles as not to discourage or defeat the construction of extensions and branch lines. Admitting a conclusion which none will controvert, the Commission denies the alleged wrong to existing and projected roads. It has in all cases considered the essential conditions upon which they ever have been or can be built and operated. It has not found in unity of management any legal or moral reason for ignoring these conditions, nor for substituting arbitrary uniform rates for reasonable compensation. It has not given to one railroad or company what belongs to another. It has not taken from the centers of population

and production their rightful advantages, nor from less favored districts such as they have, either in possession or expectancy. It has not, in plain violation of the Constitution and common justice, enforced competitive rates over mountains and deserts, where it could neither build another road, nor dig a river, nor roll an ocean. It has not attempted, to do impossible things, nor to reverse or revise the Constitution, the irreversible laws of trade, or the equally enduring principles of transportation.

This Commission can have no policy other than that of the law, which is presumed to be the welfare of the people. That their interests may be subserved by the railway system of the State, it must be studied and governed upon comprehensive business principles, with reference not alone to what they have, but also to what they want and must have. For this purpose even the most romantic and mysterious passages in the history of pioneer roads are of far less importance than their present or prospective extension, management, and use. They came in advance of ordinary business inducements. Their construction was accelerated by Government loans which are subsisting liens upon them. But for operation and maintenance they are left like other roads, dependent upon their public use at reasonable compensation. And while they have stimulated the industries and business activities of contiguous territory, and have drawn to it two thirds of the population of the State, they have a local traffic equal to less than one third of their possible equipment and working capacity. And as the cost of service, other conditions being equal, is in inverse ratio to volume of traffic, it follows that the people living along and patronizing existing roads, and especially those having none to patronize, can have nothing to gain, for an indefinite time to come, by parallel or competitive lines of road. It is as plainly in the interest of all beneficially concerned to enlarge the tributary territory and increase the local patronage of trunk lines, and to round out and perfect the railroad system of the State, by branches and feeders running east to isolated districts along the western slopes of the Sierras and west through the valleys and passes of the Coast Range, beyond the reach of competition. And the differing conditions and rates of charge upon which such subsidiary roads can alone be constructed and operated are as certain and inevitable as manifest destiny, which is simply what must and will be, near-sighted and superficial statesmanship to the contrary notwithstanding.

On the twenty-fifth day of June an order to transportation companies to appear within three days, and show cause, if any they had, why certain reductions of freight rates should not be made, was introduced by Commissioner Carpenter, and unanimously adopted, as follows:

BOARD OF RAILROAD COMMISSIONERS OF THE STATE OF CALIFORNIA.

It is ordered that the Central Pacific and the Southern Pacific Railroad Companies, for themselves and leased lines, and also all other railroad companies having offices in the City of San Francisco, be, and they are hereby, required to appear before this Board, at its office in said city, on Wednesday, the twenty-seventh day of June, 1883, at ten o'clock of said day, then and there to show cause, if any they have, why reductions on rates of freights to tide-water, and thence to all interior points in this State, should not be made, as follows:

First—An average reduction of from ten to twenty per cent for moving grain to tide-water from the following interior points, namely: Willows to Roseville Junction, Yolo to Sacramento, Knights to Sumner, Curtis to Huron, Soledad to Arena, Eden Vale and others.

Second—Such a reduction, not less than thirty-three and one third per cent on present rates, for carload lots of grain for seeding and feeding purposes, from points on tide-water to all interior points in the State, as shall make the rates on grain the same from and to the interior.

Third—The average reduction of present rates, equal to twenty per cent, on flour and mill stuffs, from mills at tide-water, and other manufacturing points, to all interior points in the State.

Fourth—An average reduction of present rates, equal to thirty-five per cent, on all kinds of household goods and furniture, and on all emigrants' movables, in carload lots, in all directions, to all points in the State.

Fifth—An average reduction of twenty per cent on present rates for fence-wire in carload lots to all points in the State.

Sixth—An average reduction of thirty-five per cent on rates for blacksmiths' coal, dairy and table salt, and other articles of the same class, in carload lots, to all points in the State.

Seventh—An average reduction of twenty per cent on the carriage of grain sacks, agricultural implements, wagons, and vehicles of all kinds, to all points in the State.

Eighth—Why reductions on present rates for the transportation of wool, and also live stock, especially in less than carload lots, should not be made.

It is further ordered that the time for showing such cause as aforesaid shall be limited to said day.

In response to the foregoing order, on the twenty-seventh day of June, the Central Pacific Railroad Company appeared for itself and leased lines, and was heard in opposition to the proposed reductions of freight rates; and thereafter, on the sixth day of July, protested against them in the written communication which accompanies this report, Appendix C.

On the first day of August, Commissioner Humphreys introduced an order, which was unanimously adopted, reducing passenger fares on the Southern Pacific Railroad, Northern Division, as follows:

It is hereby ordered by the Board of Railroad Commissioners of the State of California, that the rates of transportation of passengers over the Northern Division of the Southern Pacific Railroad, between Fourth and Townsend Streets, in the City and County of San Francisco, and the station on the aforesaid railroad known as Ocean View, shall not exceed fifteen cents per passenger, and no higher charge shall be made to or from any station in said city and county.

The order was duly served upon the proper company, and has since been, and now is, in force and operation on said road.

On the fifth day of September, 1883, Commissioner Carpenter introduced a standing order to expedite the preparation and service of schedules, and which is self-explanatory. On the fifteenth day of the same month it was adopted unanimously, and is as follows:

BOARD OF RAILROAD COMMISSIONERS OF THE STATE OF CALIFORNIA.

WHEREAS, By Section 11, Chapter 59, of the Statutes of 1880, entitled "An Act to organize and define the powers of the Board of Railroad Commissioners," it is provided that: "Whenever said Board, in the discharge of its duties, shall establish or adopt rates of charges for transportation of passengers or freight, pursuant to the provisions of the Constitution, said Board shall serve a *printed schedule* of such rates and of any changes that may be made in such rates, upon the person, copartnership, company, or corporation affected thereby; and upon such service it shall be the duty of such person, copartnership, company, or corporation to immediately cause *copies of the same* to be posted in all of its offices, station-houses, warehouses, and landing offices affected by such rates, in such manner as to be accessible to public inspection during usual business hours. And whereas, it is further provided in said section and Act that the rates of charges established or adopted by said Board pursuant to the Constitution and this Act, shall go into force and effect the twentieth day after service of said schedule of rates or changes of rates upon the person, copartnership, company, or corporation affected thereby, as herein provided." And whereas, unless waived by the party to be affected thereby, as aforesaid, the mode and time prescribed exclude all others. And whereas, it is optional with such party to waive said time and also service of printed copy of said schedule; and whereas, it is competent and proper for this Commission, when it shall "establish or adopt rates of charges," as aforesaid, to consult the convenience and preference of such party as to the form and clerical preparation of the schedule it is required to copy and post for inspection and use as aforesaid:

Now, therefore, it is hereby ordered, That in pursuance of said section of said Act, this Commission can and will establish or adopt rates of charges for the transportation of passengers and freight only by schedule; and that in the preparation thereof in the usual form for convenient use as aforesaid, the Secretary of this Commission is hereby authorized and directed to avail himself of such form or draft of such schedule as may be most conveniently copied and used by the party to be affected thereby.

And it is further ordered, That upon the completion of any schedule of rates and charges, so drafted and prepared as aforesaid, the same shall be submitted to the Commission, and it shall be "established and adopted," as aforesaid. A certified copy of the order adopting the same

shall be served by said Secretary upon the party to be affected thereby; and in case such party shall prefer for its own convenience, and to simplify the duties of all concerned, to make its own copy of all such schedules, and shall consent to put the same in operation within twenty days from and after the service of said order, and in accordance therewith, it may do so without further preliminary process or proceeding to enforce the same; *provided*, that said party, or its general manager, shall, within three days from and after the service of said order, acknowledge the service of said schedule by printed copy, expressly waiving all other service or notice thereof, in writing, addressed to said Commission, and to be filed and remain of record in its office.

And it is further ordered, That if such acknowledgment and waiver, as aforesaid, shall not be filed in said office within three days from and after the service of such order as aforesaid, then, and in that case, said Secretary shall immediately proceed to print such schedule and order, and to serve printed copies thereof on the parties to be affected thereby, and shall keep a record of his action in the minutes of said Commission.

LEGISLATION SUGGESTED.

This standing order relates to the office work of the Commission, and to its most important duties. It conforms to the simple and definite methods of the Constitution, which terminate in orders and decisions. But there is, also, the statute of 1880, Chapter 59, Section 11, which imposes upon the Commission the endless mechanical labor of preparing "printed schedules" of the rates of fares and freights it establishes or adopts and is an unreasonable and ungrammatical supplement to the Constitution. It makes the Commission, in the matter referred to, a sort of one clerk inconvenience to the companies subject to its jurisdiction, without their force or facilities for doing the work required, and to the manifest detriment of all concerned. And, while acknowledging accommodating waivers of the cumbersome service required of the Commission, they are regarded as pertinent admissions of what the law should be. It is, therefore respectfully urged that Section 11, *supra*, be so amended as to require of the Commission only those constitutional determinations, known as orders, or decisions, in compliance with which the company or companies to be affected thereby, shall be required, within a reasonable time, to tabulate, print, and post the necessary schedules.

On the twenty-first day of August, questions involving the comparative cost per mile of running trains of three and six passenger cars, and a train of fourteen freight cars, were prepared by Commissioner Foote, and submitted by the Commission to A. N. Towne, General Manager of the Central Pacific Railroad and leased lines. On the eighteenth day of September, answers were received and filed, showing expenses of movement, maintenance of track, stations, miscellaneous items, and aggregate traffic, on the roads and divisions of roads designated by the questions submitted. But, upon reviewing them, we are satisfied that neither the questions nor the answers are such as to reach the desired result, namely: the cost per mile of transporting one passenger, or one ton of freight. And after answering as to both branches of the service, Mr. Towne says: "With regard to the cost pertaining to freight and passengers, I am unable from any accounts we keep, to give you the desired information. According to the best authority it is necessary to know fifty-eight different items, all of which vary materially on different roads and branches thereof, and enter into different combinations with each other. These items of cost of movement are affected by climatic changes, the weight of trains, the cost of fuel, labor, and many other things too numerous to mention." It is, nevertheless, believed that the unit of cost, under different conditions and in each department of service, is of the first

importance, and that it should be shown by the annual returns made to this office by the several railroad companies in this State.

THE PACIFIC COAST STEAMSHIP COMPANY, PLAINTIFF, VS. THE BOARD
OF RAILROAD COMMISSIONERS OF THE STATE OF CALIFORNIA,
DEFENDANT.

In the Circuit Court of the United States, in and for the District of California.

This is a suit in equity to restrain the Commission from establishing rates of charge for the transportation of passengers and freight on the enrolled and registered steamships of said plaintiff. The pleadings will be found in the report of the Commission for 1880-81, and the jurisdictional facts are set out in the opinion of said Court embodied in this report, Appendix D.

The suit was commenced on the thirtieth day of December, 1880, and was decided against the defendant on the seventeenth day of September, 1883.

For the purpose of prosecuting an appeal to the Supreme Court of the United States, which must be done, if at all, within a year from the rendition of the judgment in the lower Court, the Commission has no funds at its disposal. In this connection, the following letters and resolution are self-explanatory:

CONTROLLER'S DEPARTMENT,
SACRAMENTO, October 9, 1883. }

Hon. W. R. Andrus, Secretary:

DEAR SIR: At Governor Stoneman's suggestion, I inform you that attached to the voucher or claim for counsel fees in the case of The Pacific Coast Steamship Company vs. The Board of Railroad Commissioners, is the following: At a meeting of the Railroad Commissioners, held at their office, in the City and County of San Francisco, on December 31, 1880, a resolution was offered by Commissioner Stoneman and adopted by the Board:

"Resolved, That this Board approves of one thousand (\$1,000) dollars for Belcher & Belcher, one thousand dollars (\$1,000) for Chipman & Garter, and five hundred (\$500) dollars for Clitus Barbour, as retainers and fee in the case of The Pacific Coast Steamship Company vs. The Board of Railroad Commissioners of the State of California, with the understanding that this case is to be conducted to its final termination. This is to cover all fees and expenses for all additional counsel during the present fiscal year.

"W. R. ANDRUS, Secretary of the Board."

Respectfully,

JOHN P. DUNN, Controller.

CONTROLLER'S DEPARTMENT,
SACRAMENTO, October 11, 1883. }

Hon. W. R. Andrus, Secretary Board of Railroad Commissioners:

DEAR SIR: Yours of yesterday at hand. The Governor desires me to say for him that he understood, and it was his intention, that the fees paid in this case should carry the case to its final determination in the United States Supreme Court. That it should be no further expense to the State.

Yours truly,

JOHN P. DUNN, Controller.

On the nineteenth day of October, 1883, the foregoing letters were presented to the Commission, and thereupon Commissioner Carpenter introduced an order, which was unanimously adopted, setting out a copy of the resolution, as it is in the last of said letters, and as it appears of record in the minutes of said Commission, and concluding as follows:

Having actual knowledge of the fact that in the case to which the foregoing resolution relates, a decree has been rendered by the Circuit Court of the United States in and for the District of California; and it appearing that said decree is in favor of the Pacific Coast Steamship Company and against the Commission; and it appearing further that there has been no consultation, or concert of action, by or between the attorneys of record, on behalf of the Commission, to determine what further steps, if any, should be taken in said case, or whether an appeal from said decree is desirable. Now, therefore, said attorneys are all and severally respectfully requested to inform this Commission, in writing, whether they regard said decree as conclusive of the issues involved therein, or a "final determination" thereof within the meaning and intent of said resolution.

The Secretary is hereby directed to forward the foregoing resolution and request to each of said attorneys, or their respective firms.

Only the following letter has been received, and it is believed to express the opinion of all the attorneys, touching the terms of their employment and their obligations in the premises:

RED BLUFF, CAL., October 21, 1883.

W. R. Andrus, Esq., Secretary Board of Railroad Commissioners, San Francisco:

DEAR SIR: Replying to your resolution transmitted to us by letter of October nineteenth instant, we have to say: That we regard the case of The Pacific Coast Steamship Company vs. Railroad Commissioners, brought in the United States Circuit Court, and in which we were attorneys for the Board, as having been "conducted to its final determination" in that Court, and our connection therewith terminated by the decision of the Court recently announced.

We understand the law of retainer to be that the employment of the attorney ceases with the final judgment of the Court in the case in which the attorney is retained to appear. That unless there is an agreement in terms that the retainer includes services upon appeal to a higher Court, such duty would not be imposed by the original retainer.

This, we hope, answers your resolution.

Very respectfully,

CHIPMAN & GARTER.

In the absence of the desired advice by the attorneys of record, who consider their engagement at an end, the opinion of the Court is the best and most reliable in the case. Upon the points decided it appears to be supported by the authorities cited. Unless, therefore, an appeal can be taken upon a question not decided in the lower Court—namely, that of its jurisdiction—it would seem to be a good case in which to seriously consider the uncertainty of everything, except attorney's fees and costs.

On the nineteenth day of October, 1883, Commissioner Foote offered his first schedule of passenger fares, the same in form as that of Commissioner Humphreys, adopted on the twenty-sixth day of June, and applying to the same roads. It fixed a uniform maximum of three cents per mile for all of them, and adopted existing rates below it. It proceeded, therefore, upon theories rejected by the Commission, and in themselves considered inconsistent and novel. It rests upon but one of the items entering into the cost of service, and has been sanctioned by no Commission in the Union but that of Illinois, and by no Legislature but that of Texas. There are against it, therefore, not only the weight of authority and precedent, but also all the conditions of service, except distance. And even if the cost of service could be measured by distance alone, the rate per mile would be the sole and exclusive rule of compensation, and to adopt or continue differential rates below it, would be an eccentric departure therefrom. The Commission, therefore, adhered to its former reductions, and the principles upon which they were made, and when, upon the sixteenth day of November, 1883, Commissioner Foote moved the adoption of his schedule, he voted for, and Commissioners Humphreys and Carpenter against, the motion.

After making comparisons showing discrepancies in rates and classifications of freight, without any corresponding difference in cost or

conditions of service, Commissioner Carpenter prepared, and on the nineteenth day of October, introduced the order following:

[Order No. 13.]

BOARD OF RAILROAD COMMISSIONERS OF THE STATE OF CALIFORNIA.

It is hereby ordered that existing classifications and rates of charge for freight, in straight or mixed carload lots, on all railroads and lines of transportation, and the several divisions and branches thereof, within this State, owned, leased, and operated by the Central Pacific Railroad, shall be and are changed, reduced, and established, as follows, to wit:

First—For grain, including all the cereals, from San Francisco, Port Costa, Stockton, and Sacramento, to all other points, and in all directions between the same, or any of them, thirty-five per cent less than existing rates, provided that rates "in" or from tide-water, if not more than twenty per cent in excess of rates "out," or towards tide-water, shall remain as they now are.

Second—For flour and millstuffs of all kinds, in sacks or barrels, from San Francisco, Port Costa, Stockton, and Sacramento, to all other points in the State, and in all directions between such points, twenty-five per cent less than existing rates, provided that when such reduction will make the rate "in" less than the existing rate "out," present rates shall prevail.

Third—Household goods, furniture, farming utensils, live stock, and whatever is comprised in the effects of a family, or described as emigrants' movables, are included with commodities of the fourth class, and for transportation in any direction shall be subjected to the same and no higher rate of charge.

Fourth—For grain sacks, bags and bagging, agricultural implements, wagons and vehicles of all kinds, in all directions, and to all points in the State, twenty per cent less than existing rates.

Fifth—Fence wire, iron pipe, bar, sheet, and Russia iron, horseshoes and nails of all kinds, shall be and are hereby included with third class freight in the existing schedules of said company, and shall be subject to the same and no higher rate of charge.

Sixth—Blacksmiths' coals and table and dairy salt are hereby included with commodities of the fifth class, and shall take the same rate of charge.

Seventh—Wherever, in the existing freight schedules of said company, green fruit constitutes a special class, such class is hereby abolished, and all species of green fruit included therein shall be classed with beans, flaxseed, mustard seed, broomcorn, hops, and California wine in wood, and shall be subject to the same and no higher rate of charge; and whenever, in said schedule, green fruit is included with second or any higher class of freight, it shall be and is hereby included with freight of the third class, and shall be subject to the same and no higher charge.

Eighth—It is further ordered that a certified copy hereof shall be immediately served on said company, and if within three days after such service said company shall file with the Secretary of this Commission a written waiver of a separate schedule and of a printed copy thereof, and shall specify therein the time, not exceeding twenty days from the date of said service, within which said changes of classes and reductions of rates will be made and put in force, then and in that case said company may make such changes of classes and reduction of rates in its existing schedules and by such circulars to agents and in such form and manner, subject to lawful publicity, as shall be most convenient for inspection and use; and such changes and reductions shall be made in the same form and manner by the Secretary of this Commission in the schedules of said company now on file in this office, and shall take effect accordingly.

On the twenty-third day of October it was unanimously adopted, and served upon the Central Pacific Railroad Company and its leased lines. Thereupon the following correspondence occurred, which is explanatory of the foregoing order and the method of its execution:

CENTRAL PACIFIC RAILROAD COMPANY, OFFICE GENERAL MANAGER, }
SAN FRANCISCO, October 26, 1883. }

Hon. W. R. Andrus, Secretary State Board of Railroad Commissioners:

DEAR SIR: The Central Pacific Railroad Company owns receipt on the twenty-fourth instant of your communication transmitting copy of Order No. 13, made by your honorable Board.

On the sixth of July last this company entered its solemn protest against reduction in its freight charges, contemplated by your honorable Board. Among other specifications in that protest was one against the injustice of selecting the tariffs of said company alone as a subject for reduction; notwithstanding said company's system is made up of branch and leased lines, which, under existing tariffs, could not be operated with profit as separate and independent roads. Order No. 13 is made to apply to all the railroads and lines of transportation, and the several divisions and branches thereof, owned, leased, or operated by the Central Pacific Railroad Company and no other. The company respectfully submits that the charges upon all of its lines are reasonable *per se*, and that when compared—charges and character of service—with the charges and service of other railroad lines within the State, they are materially lower

than those of other lines not affected by Order No. 13, and whose tariff, so far as public knowledge of the purpose of the Commissioners goes, it is not the intention of your honorable Board to disturb. It must therefore protest that in reducing its tariffs under these circumstances your honorable Board is perpetrating a discrimination which, if legal, is unreasonable, unjust, and indefensible. It cannot, therefore, respect Order No. 13, except under protest, which it now enters and wishes spread upon the records of the Board.

Please inform the company: First—Whether it is the intention of the Board that Order No. 13 shall apply to rates of this company's steamer line on the Sacramento River? Second—Whether the following is a correct statement of the intent and meaning of specification "first" of the order: Where the present grain rates "in" from tide-water points are not more than twenty per centum above the grain rates "out" or to tide-water points, no reduction is ordered; that wherever said "in" rates do not exceed said "out" rates by more than twenty per cent they shall be reduced to that figure; provided, that in no case shall the reduction be more than thirty-five per cent from present "in" rates?

With respect to the eighth specification: The law requires the Board to make a separate schedule and serve a printed copy thereof upon the railroad company, and that the railroad company shall have twenty days after said service in which to put the tariff in effect over its lines.

This company will waive the service of a printed copy of a separate schedule prepared by the Board, provided it is accorded the necessary time in which to properly do the work said waiver imposes upon it.

A reasonable time would seem to be such as the Board would require to do the work, plus the twenty days allowed by law after service of the Board's printed schedule.

The company will further undertake to prepare and publish the necessary schedules and notices without unreasonable delay, and to do it under the supervision of the Secretary of your honorable Board. When completed, they will, under the above protest, be put into effect immediately.

Very respectfully, your obedient servant,

A. N. TOWNE, General Manager.

By J. C. STUBBS, Freight Traffic Manager.

THE ANSWER OF THE BOARD.

In answer to the questions propounded, the following letter, which explains itself, has been sent to Mr. Towne:

OFFICE BOARD OF RAILROAD COMMISSIONERS,
SAN FRANCISCO, October 29, 1883. }

To A. N. Towne, General Manager Central Pacific Railroad Company:

SIR: Your letter of the sixteenth instant by J. C. Stubbs, Freight Traffic Manager, acknowledging receipt of Order No. 13 of this Commission, has been received and considered. We find in your communication no reason to recede from the reductions upon which we had determined. And while adhering to the order substantially as it is, we disclaim and deny the alleged discrimination against your company, or any of the roads which it owns or leases and operates. In assuming this control to the extent of our jurisdiction, it was proper to commence somewhere, and we submit that the precedence accorded to the Central Pacific and its leased lines was to have been expected, and is not a just cause of complaint. It is rather an earnest of the attention and an example of the regulating power to which other companies are subject, and from which they will not be exempted.

Our answer to questions, touching the scope and meaning of the order, are as follows:

First—The leading object of the order is to reach and reduce non-competitive inland rates, and not those of your company's steamer line on the Sacramento River. It is intended to affect only such freight charges as are included in the specific classes and schedules of inland rates.

Second—All grain rates "in" from tide-water, which are now not more than twenty per cent in excess of rates "out," or to tide-water, are to remain as they are.

Subject to this limit, the reductions to be made may be less but never more than thirty-five per cent of existing rates. We fail to see any difference of opinion relating to this part of the order.

In accordance with the order thus explained, the changes of classification are to be made, and the necessary tabulation of rates are to be prepared. Thanking you for the waiver of your technical right to cast the entire work upon the Commission, its Secretary is authorized by a standing order to avail himself of your assistance, and will have such extension of time as shall be found necessary for the clerical labor to be performed.

Very truly,

G. J. CARPENTER,
W. P. HUMPHREYS,
W. W. FOOTE,
Railroad Commissioners.

It will be seen that the reductions upon cereals and millstuffs are made directly upon inland rates, and in such manner as not to adopt but to abolish discriminations against interior points, which could only have been discovered by painstaking comparisons. And an examination of the nature and varying percentage of the reductions made, will show how some of the most constant and prolific causes of complaint have been reached and removed. The following tables will serve as brief illustrations of the comparisons upon which the order was based, and of the reductions by change of classification:

SOUTHERN PACIFIC RAILROAD.

From San Francisco south to Yuma.	Difference in Rates by Classes. (In Cents, per 2,000 lbs.)								
Miles.	First	Second	Difference per cent.	Second	Third	Difference per cent.	Third	Fourth	Difference per cent.
10	135	115	15	115	115		115	100	13
50	300	260	13	260	220	15	220	130	41
80	320	280	13	280	240	14	240	200	25
110	500	410	18	410	360	12	360	280	22
140	820	740	10	740	670	9	670	380	43
170	1,120	1,020	9	1,020	930	9	930	430	54
200	1,380	1,310	5	1,310	1,180	10	1,180	475	51
230	1,680	1,600	4	1,600	1,460	9	1,460	525	64
260	2,040	1,860	9	1,860	1,700	9	1,700	585	66
290	2,300	2,060	10	2,060	1,900	8	1,900	635	72
340	2,520	2,200	12	2,200	2,080	5	2,080	715	66
390	2,600	2,300	12	2,300	2,160	6	2,160	795	83
440	2,600	2,300	12	2,300	2,160	6	2,160	880	60
500	2,600	2,300	12	2,300	2,160	6	2,160	950	56
550	2,800	2,300	18	2,300	2,160	6	2,160	1,090	50
570	3,000	2,480	14	2,480	2,160	13	2,160	1,135	47
590	3,300	2,780	16	2,780	2,340	16	2,340	1,200	48
620	3,980	3,240	19	3,240	2,780	14	2,780	1,300	53
660	4,420	3,860	13	3,860	3,420	11	3,420	1,430	58
730	5,320	4,740	11	4,740	4,000	15	4,000	1,580	61

THE CENTRAL PACIFIC.

From San Francisco north between Sacramento and Redding.	Oregon Division—C. P. R. R. Difference in Rates by Classes. (In cents, per 2,000 lbs.)											
Miles.	First	Second	Difference per cent.	Second	Third	Difference per cent.	Third	Fourth	Difference per cent.	Fourth	Fifth	Difference per cent.
150	480	440	8	440	400	9	400	200	50	200	200	---
170	520	460	11	460	400	13	400	300	25	300	280	7
210	580	500	14	500	440	12	440	440	---	440	400	9
240	700	640	8	640	580	9	580	530	8	530	490	11
260	900	840	7	840	760	9	760	600	21	600	560	7
300	1,360	1,140	16	1,140	1,060	7	1,060	690	35	690	650	6
320	1,520	1,220	19	1,220	1,140	6	1,140	730	36	730	690	5

FOURTH ANNUAL REPORT OF THE

REDUCTION ON GREEN FRUIT, IN CENTS, PER TWO THOUSAND POUNDS.

To San Francisco from—	Old.	New.	Per cent. Decrease.
Sobranate	140	90	35.5
Haywards	160	140	12.5
San José	260	247	5
Livermore	260	230	11.5
Bethany	280	190	32
Lodi	300	280	7
Tehama	980	840	14.33
Red Bluff	1,000	840	16
Redding	1,000	840	16
Morrano	340	230	32.33
Modesto	480	310	35.5
Merced	750	475	36.5
Berenda	835	505	40
Fresno	880	569	36
Goshen	940	600	36
Hanford	965	600	37
Huron	1,000	600	40
Tulare	960	600	38
Sumner	1,000	600	40

On the twenty-first day of December, 1883, the new classification and schedule, containing two hundred and eighty-two printed pages, averaging eight columns of figures to the page, was submitted to the Commission by its Secretary, under whose supervision they had been prepared. Having been examined and found to be in accordance with the order directing their preparation, they were established and filed in the office as follows:

BOARD OF RAILROAD COMMISSIONERS OF THE STATE OF CALIFORNIA.

The said Commission, at a special meeting thereof, duly called and held at its office in the City of San Francisco, December 27, 1883, to consider the changes of classification and schedule of freight rates submitted by its Secretary at its last regular meeting for examination; and it appearing that they have been prepared and are in all respects in conformity with Order No. 13 of the Commission, and that the reductions have been made and are in accordance therewith: Now, therefore, it is hereby ordered by the Commission that said changes of classification and schedule be filed and remain of record in this office, and that they be and are hereby established, to take effect and be in force on all and each of the roads to which they apply, on and after the first day of January, 1884.

Thereupon written notice, of which the following is a copy, was forwarded to the General Manager of the companies to be affected thereby:

OFFICE OF THE BOARD OF RAILROAD COMMISSIONERS, STATE OF CALIFORNIA,
SAN FRANCISCO, December 27, 1883. }

A. N. Towne, General Manager Central Pacific Railroad Company and Leased Lines:

SIR: On the twenty-first instant the Secretary of this Commission submitted for examination the freight classifications and schedule containing two hundred and eighty-two pages of printed matter, which had been prepared under his supervision, with your obliging and effective assistance. Having been examined and found to be in accordance with Order No. 13 of this Commission, prescribing the changes of classification and reductions to be made, they have been filed and established in this office, to take effect and be in force on all roads to which they apply, on and after the first day of January, A. D. 1884.

G. J. CARPENTER,
President Railroad Commission.

WILLIAM P. HUMPHREYS,
Railroad Commissioner, Second District.

On the sixteenth day of November, 1883, Commissioner Foote introduced the draft of an order for the reduction of certain freight rates, as follows:

It is hereby ordered, that on all railroads and lines of transportation in this State, owned, leased, or operated by the Central Pacific Railroad Company, freight rates shall be and are hereby reduced and established as follows:

First—On grain, including all the cereals, from all interior points in this State to all other interior points, and to all tide-water points, in carloads straight or mixed, there shall be a reduction of twenty (20) per cent from the rates now charged, per tariff books of June 1, 1881. Upon grain in less than carload lots the rates shall be reduced thirty (30) per cent in all cases from those now in force.

Second—Green fruit, in less than carload lots, where now rated as *first class*, shall be rated as *third class*, per tariff books on file in this office.

Third—Upon wool, from all points in this State, a reduction of twenty (20) per cent, whether shipped in carload lots or in smaller quantities.

Fourth—Upon live stock of all kinds, in carload lots, to and from all points in this State, now shipped under special contract rates, there shall be made a reduction of twenty (20) per cent upon said rates as they are now charged.

Fifth—Upon beans, potatoes, flaxseed, alfalfa seed, hops, onions, and mustard seed, between all points in this State in either direction and in any quantity, and irrespective of the classification which now obtains, there shall be a reduction of twenty (20) per cent from existing rates.

Sixth—Upon wood, coal, lumber, shingles, laths, brick, cement, lime, and ores of all kinds, to and from all points in this State, and irrespective of present classification, in carload lots or in smaller quantities, there shall be a reduction of twenty (20) per cent from existing rates.

Seventh—It is further ordered that a certified copy of this order shall be immediately served upon said company, and if within three days after such service said company shall file a written waiver with the Secretary of said Board of Railroad Commissioners of the State of California of a separate schedule and printed copy thereof, and shall specify therein the time, not exceeding twenty days from the date of said service (unless upon good cause shown said Board of Railroad Commissioners shall grant further time), within which said changes of rates and reductions will be made and put in force, then, and in that case, said company may make such changes and reductions in its existing schedule, and post the same according to law and in accordance with this order; *provided*, that if the company accept this order its schedules during preparation shall be open to inspection by the Secretary or any member of said Board. *It is further ordered*, in the event that said company shall fail to accept this order within the time named, that the Secretary is hereby directed to prepare freight schedules as soon as possible in accordance with this order.

This is the familiar requisition in a new form, for lumping reductions of existing rates, unsupported by any comparative statement showing what they are or what they should be. It proceeds upon the discarded hypothesis, that they are all too high in the same proportion, and thus, without checking or comparing them, rests upon proposed reductions in the same ratio. In short, it proposes blind movement without method and without such prerequisite examinations and equations of existing rates as shall make the preparation of one schedule subserve the double purpose of reduction and regulation; and as a uniform reduction by one schedule would adopt and establish existing discriminations, these again must be found and eliminated, if at all, in the only possible way, namely: by detailed comparisons and differential reductions. That such a proposition can never lessen, but may double the work it postpones or avoids, is too evident for denial or dispute. Hence, for the purpose of examination, its consideration has been continued.

On the nineteenth day of October, 1883, on motion of Commissioner Carpenter, the Northern Pacific Railroad Company was ordered to show cause why the maximum of passenger fares on its road should not be reduced to five cents per mile. Thereafter, on the sixteenth day of November, N. D. Rideout, chief owner, and A. J. Binney, General Manager of said road, appeared and satisfied the Commission that such reduction should not be made. And upon the repre-

sentation of the respondents, that round-trip tickets would benefit the greater number of their patrons, and would be issued, the proceeding was unanimously dismissed.

At the meeting of the Commission held on the sixteenth day of November, 1883, on motion of Commissioner Humphreys, the seven railroad companies following, namely: The South Pacific Coast, North Pacific Coast, San Francisco and North Pacific, Vaca Valley and Clear Lake, Nevada County Narrow Gauge, Santa Cruz, and the California Southern, were ordered to appear and show cause, if any they had, why reductions of passenger and freight rates corresponding to those made on the Central Pacific system should not be made on their respective roads.

On the twenty-first day of December the hearing of the San Francisco and North Pacific Railroad Company was continued till the eighteenth day of January, 1884. The other companies summoned appeared by their legal representatives and contested the proposed reductions. The verified statements of those not making oral arguments will be found in Appendix E. Facts and figures showing the financial conditions of the same companies, and also of the California Northern Railroad Company, will be found in Appendix F. The documentary and other evidence is all to the same effect, and for the purpose of showing the injustice and evil consequences of establishing the same rates of charge, on all roads of the same or different systems, is cumulative and conclusive.

There are three thousand one hundred and seventy miles of railroad in this State, two thousand nine hundred and fifty-seven miles of broad-gauge, and two hundred and thirteen miles of narrow-gauge. Of this aggregate mileage, two thousand and nineteen miles, including trunk and branch lines, are operated under the same management, but subject to many different and distinct conditions of ownership and lease, by the Central Pacific Railroad Company, and are all included in its annual statement to this office, of which Appendix F is a synopsis. Other companies, under separate but substantially similar management, own and operate one thousand one hundred and fifty-one miles of road. Omitting details, as to each, it may be affirmed generally, of all the roads in this State, that by yearly betterments and renewals of track, equipment, stations, and terminal facilities, they are kept in a good and constantly improving condition. And that the railroad service of this State is fully equal, if not superior, to that of any other, for safety, comfort, and convenience resulting from cautious and systematic management, is the concurrent testimony of observing and competent judges. Admitting, therefore, the general superiority of the service, and that no official supervision could exempt it from errors and accidents, it, nevertheless, remains to be said, that until this Commission shall be authorized by statute to make such inspections and investigations, orders and decisions, as go to the safe and convenient public use of railroads within its jurisdiction, it will remain, in that respect, a powerless anomaly among Railroad Commissions of this and all other countries.

From information furnished by A. N. Towne, General Manager of the Central Pacific Railroad Company and its leased lines, the following synopsis is deemed worthy of a place in this report. It is believed to be a correct general statement of the improvements, bet-

terments, renewals, and extensions on the system of roads in his charge during the past year.

The road on the west side of the Sacramento River to Tehama was completed at the beginning of the year. On the line of the California and Oregon extension of the Central Pacific road, there have been twenty miles of new track laid, besides a large amount of grading and work on tunnels. The contemplated connection at the State line with the Oregon and California road is assured, and will probably be made in the early part of 1885.

The Colorado Division of the Southern Pacific system has been extended one hundred and eleven and forty-three hundredths miles, from near Ash Hill Station to the Colorado River, at the Needles, where it connects with the Atlantic and Pacific Railroad.

The most important renewals and betterments to track and terminal facilities, within the State of California for the first ten months of the year, are briefly as follows:

Between Lathrop and Goshen, in round numbers, twenty-nine miles of track were renewed with steel rail; between Oakland Wharf and Niles, one mile; four miles, from Oakland Point to corner of First and Webster Streets, Oakland; thence, to Mastic Station, Alameda, also laid with steel rail; between San José and Brighton, two miles; Roseville and Reading, three miles; Goshen and Mojave, thirteen and a half miles; Mojave and Los Angeles, three miles; Los Angeles and Yuma, sixteen miles; also, about three miles of new steel track at Los Angeles Station.

The number of ties used within the State between January first, and October thirty-first, was two hundred and thirty-three thousand two hundred and fifty-eight.

Structures erected during the year 1883, in the way of bridges and buildings, are as follows:

San Francisco, freight shed at Sixth and King Streets, three hundred and six by seventy-five feet; Oakland Wharf, coal bunkers, three hundred and four by thirty-three feet; coal bunkers at Port Costa, eight hundred by thirty-three feet; combination freight and passenger depot at San Lorenzo, seventy-eight by twenty-one feet; Watts Station depot, twenty-one by eleven feet; oil and pump house at Port Costa and Benicia, ferry slip and extra apron, covering one hundred and ten feet each; covering bridges at Story and Thomas Creek; Maxwell, section house; Sacramento, wheel foundry, with attached sheds, engine house, etc., four hundred by one hundred feet; Sacramento, tunnels under track in yard; Rocklin, sand house, thirty by thirty-four; Rocklin, blacksmith shop, forty-one by twenty-six; Sacramento, casting shed, one hundred by twenty; snow-plow house at Truckee; Anderson, freight house extension, fifty by thirty-two; water station and wagon bridge, Vina and Tehama; combination depots, ninety-three by twenty-five, at Athlone, Fowler, and Selma; cottages for employes at Mojave, four, thirty-five by twenty-six; trainmen's house, same place, seventy-six by seventeen; employes' cottages at Sumner, four, thirty-five by twenty-six; coal house at Sumner; two water stations, covering two iron turn-tables; extending two round-houses, Tulare and Sumner; Bealville, telegraph office, twenty-seven by thirteen; combination hotel and depot at Los Angeles, three hundred and forty-seven by thirty-one feet; also, same place, coal house, two hundred and sixteen by sixty feet, and addition to freight house, one hundred and twenty by forty feet; section house

and telegraph office at Lancaster and San Fernando; hotel and engine house, seventeen by fourteen, at Monte; round-house at Seven Palms; stock corral at Campton; coal platform at Davis; wagon bridge and stock corral at Cornwall and Creeger's farm.

In addition to the above, there were several bridges and buildings that were burned and rebuilt, with improvements on the original. These, together with improvements on the Colorado Division, and on the Oregon extension, are not taken into account.

On the Sacramento and Placerville Railroad the renewals and betterments, for the first eleven months of the year, were as follows: New ties placed in track, six thousand seven hundred and eighty-five, at a cost of \$3,256 80. Trestle at Latrobe, seven hundred and fifty-five feet long, forty-five feet high, supported by forty-six bents, and covered by one thousand five hundred feet of fifty-pound steel rail, entirely rebuilt with new materials, at a cost of \$8,751 54. Also, other repairs of bridges, etc., amounting to \$502 26.

In the month of May the Commission unanimously determined to itinerate through the southern counties of the State. Upon a written invitation by all of its members, it was accompanied by a freight agent of the Central Pacific Railroad Company. With safety and convenience it was conveyed to and from its appointments in a special car, promptly and liberally provided and furnished by the same corporation. It went as far south as San Diego, and as far north as Stockton. As per published appointments it held nine public meetings. At Colton, Los Angeles, and Stockton, many people being present, no complaints were made. At Bakersfield, Visalia, Hanford, Fresno, Merced, and Modesto complaints and speeches were made. Although not always germane to subjects to be considered by the Commission, or within its jurisdiction, they were generally against railroad corporations, or some alleged abuse in their management. Some related to former rates, which upon examination of the schedules were found to have been reduced, some to individual grievances and disputes which were outlawed in the Courts, and not within the jurisdiction of the Commission, and some to local and special excesses and inequalities of fare and freight, which have since been regulated and reduced. As was to have been presumed, the most valuable and reliable information obtained was from citizens who belonged to the commercial and producing classes, and, therefore, fairly and properly represent them, and in communications dispassionately written, submitted, and filed for reference.

During the past year, at its office in San Francisco, the Commission has held forty-three regular meetings, with mixed results. Except for hearing and determining complaints, receiving and making reports, and deciding propositions before it, they have been the least profitable of its proceedings. The sinister tendency of those debating unfamiliar subjects, is to something else. Wherefore it is that discussions and inquiries properly involving only the present value, ownership, and financial condition of railroads, and what is reasonable compensation for service thereon, have so often drifted into stale controversies concerning their construction, the government aid they have received, and their resulting moral obligations to the public. Thus it is that so much of the testimony taken by the Commission is immaterial, and that so much of the discussion before it has been uninformative and inconsequential. But notwithstanding mistakes, of which it is fully conscious, it has succeeded in bringing out and

preserving, as the basis of future action, a large amount of evidence and statistics, both relevant and material to the work and business of the office.

Since the ninth day of January, 1883, this Commission has been in session next door to the importing firms of San Francisco, all but one of which are said to have entered into so called special contracts with the Union Pacific and other eastern railway companies, for the transportation of west bound through freight, all rail, at *less than schedule rates*, a fact that may account for the apparent satisfaction of the contracting parties. With the contracting eastern carriers the Central Pacific Railroad Company prorates on all through traffic. The contracts are executory and contain a clause in restraint of patronage to ocean carriers on such freight, coupled with penalties for its violation, and some other provisions, which might, in a proper case, be held to be void. Every one of them is a contract between citizens of this and other States, and from beginning to end, judging from a blank form, which is all that has ever been exhibited to the Commission, relates to inter-State commerce. In a suit, therefore, to enforce or rescind one of these contracts, or to annul the clauses referred to, the parties would find themselves in the Federal Courts.

But the purpose of this reference is not to indicate a remedy for the alleged wrongs of contracting firms, all of which are presumed to know their rights, and to have none which they dare not maintain. It is not to notice, much less to answer, sensational appeals on their behalf by irresponsible proxies, in whose mouths it does not lie to complain for them. It is not to tender advice or sympathy, nor to prejudice acts or contracts, of which absolutely nothing is known, except by the most unreliable hearsay, or some irrelevant testimony, or side admission in a collateral proceeding, the record of which, as every lawyer knows, would be inadmissible in any case between the contracting parties. It is briefly to say for the Commission, that none but the real parties in interest, by themselves, or their authorized agents, can put such powers as it has in motion. Until they have done so, it will keep within the inviolable circle of judicial fairness, and reserve its decision.

The Constitution permits and therefore intends unanimity of opinion and action in this office. It nevertheless provides against irresponsible and distracting opposition. It says: "The act of a majority of said Commissioners shall be deemed the act of said Commission." (Article 12, Section 22.) By requiring an annual report it makes that the last act of the year. It very properly makes each administration an entirety, and couples with its responsibilities the rightful exercise of undivided power. The Commission, therefore, in preparing this report, as its own act, omitting only inconsequential talk and disputation, has dwelt upon the weightier matters of the law and its requirements. Conscious of mistakes, but avoiding no responsibility, it has endeavored to present a very full record of the year's transactions. The printed copies of resolutions, orders, decisions, and rulings, and other documents, have been compared with their originals on file and of record and used, thus condensing the manuscript and facilitating reference.

The theories and practice which make railroad management the subject of careful study and conservative control are not new in this year nor in this office. The first Transportation Commission of this State in its last report gave them its unqualified and repeated

approval. With a much riper experience than our own it said: "The subject must be approached step by step, and the way carefully studied as we proceed." In this conclusion every Railway Commissioner in the Union concurs. That this Commission came to the same conclusion at the beginning of its present term is perhaps no merit of its own. As a tried and trusted ex-Commissioner of Iowa has truthfully said, only freshmen, by an over-estimate of themselves, ever held any other opinion. And it may be doubted if any conscientious officer ever approached the subject, with an intelligent estimate of its real magnitude and of the growing and enduring interests it involves who did not speedily discover and confess the duty and necessity of research and reflection.

As only steps thus taken are progress, and only proceedings thus matured can or should be enforced, the Commission has found in them its best policy and highest duty. The first order of business therefore, was to consider and formulate its methods. These have been illustrated by the resulting orders, decisions, and official acts outlined in this report. The only object of their exposition has been to submit the record of accomplished facts with some of the reasons therefor. To the extent that they are consistent, consecutive, and advancing results of safe, practical, and effective modes of procedure, they are good beginnings and precedents for progressive and continuous work. To this there is practically no end, and in the long run it is the best test of the processes by which it is prosecuted. For the Commission, therefore, there is no alternative but to pursue its work by the methods adopted, subject to the inadequate means at its command, and to such improvements as may come from further experience and information. The results thus attained will be the subjects of future reports.

Respectfully submitted.

G. J. CARPENTER,
President Board of Railroad Commissioners, State of California.

WM. P. HUMPHREYS,
Railroad Commissioner, Second District.

Attest:
[SEAL.]

W. R. ANDRUS,
Secretary of the Board.

APPENDICES.

APPENDIX A.

TEXT OF MANAGER TOWNE'S REPLY TO THE RAILROAD COMMISSION—
COST OF THE CENTRAL AND SOUTHERN PACIFIC AND OTHER GREAT
LINES—GROSS EARNINGS AND OPERATING EXPENSES COMPARED—
VALUABLE STATISTICS REGARDING ACREAGE AND POPULATION
SERVED BY THE LINES—RENTS PAID FOR LEASED LINES—INTER-
STATE CONNECTIONS—DIFFERENTIAL RATES AND SPECIAL CON-
TRACTS—AVERAGE FREIGHT AND PASSENGER RATES PER MILE—
INFORMATION NEVER BEFORE PUBLISHED.

SAN FRANCISCO, February 20, 1883.

To the honorable Board of State Railroad Commissioners :

GENTLEMEN: At a session of your honorable Board held on Monday, the fifth instant, the following circular (No. 2) was adopted as a substitute for No. 1, and was handed to me on the ninth instant.

In response to the inquiries, I beg leave to answer each in its order as best I can from the statistics and information in my possession.

You say: Having under consideration the rates of charges and methods of business in force in the passenger and freight departments of the transportation companies subject to our supervision in this State, and in the interest of all concerned, desiring to make only such revision and changes of existing schedules, classifications, and rates of charges as, upon examination and reflection, we shall deem just and reasonable, we respectfully and urgently request that at your earliest convenience, within twenty days, if you have not already done so, you prepare and file in this office verified statements and exhibits in answer to our first circular, to wit:

TOTAL COST OF THE ROAD.

First—What has been the total cost of your road and equipments to date? If any company owns, operates, or controls more than one line of road, please state the cost of each separate line.

Answer—The cost of the Central Pacific Railroad, including right of way, depots, buildings, wharves, docks, etc., to December 31, 1882, is \$138,553,455 29.

The cost of equipment, including shops, machinery, real estate, river steamers, material, fuel, etc., is \$16,665,205 89.

Of this last amount there is over \$4,000,000 of material and fuel on hand, which is necessary on account of being so far removed from basis of supplies.

The cost of the roads below named, together with equipment, real estate, shops, etc., was:

Southern Pacific of California.....	\$65,378,080 00
Southern Pacific of Arizona.....	29,697,188 59
Southern Pacific of New Mexico.....	11,069,800 15
Los Angeles and San Diego.....	1,113,490 20
Los Angeles and Independence.....	510,321 44
California Pacific.....	19,128,364 15
Stockton and Copperopolis.....	733,991 86
Northern Railway.....	10,894,830 56
San Pablo and Tulare.....	2,914,822 49
Amador Branch.....	212,167 15
Sacramento and Placerville.....	3,050,234 70

GROSS EARNINGS AND OPERATING EXPENSES.

Second—What were your gross earnings for the year 1882?

Answer—Gross earnings for the year 1882 were \$25,662,757 12.

Third—What were your operating expenses for the year 1882?

Answer—Operating expenses for 1882, exclusive of interest, taxes, general, legal, engineering, and land department expenses, which amounted to \$4,477,996 57, were \$16,067,183 66.

NOTE.—Operating expenses as above.....	\$16,067,183 66
Other expenses as above.....	4,477,996 57
Total expense.....	\$20,545,180 23
Additional payments and requirements from income of 1882, com- pany's sinking fund.....	1,034,760 00
U. S. Government sinking fund and transportation eastward.....	1,100,000 00
Total.....	\$22,679,940 23

PROPORTION OF OPERATING EXPENSES TO GROSS EARNINGS.

Fourth—State the per cent of operating expenses as compared to gross earnings for each year since the road has been in operation.

Answer—The per cent of operating expenses to gross earnings each year, from 1864 to 1882, are as follows, to wit:

1864-5.....	36.77	1874.....	38.71
1866.....	23.22	1875.....	41.41
1867.....	23.27	1876.....	46.23
1868.....	36.46	1877.....	47.20
1869.....	52.78	1878.....	50.08
1870.....	49.31	1879.....	59.51
1871.....	43.34	1880.....	58.73
1872.....	41.68	1881.....	57.52
1873.....	38.63	1882.....	62.60

VALUATION AND TAXES.

Fifth—What is the total value of all your property in this State at this time?

Answer—I am unable to give you the desired information.

Sixth—What was the total amount of taxes assessed against the road in this State, during the past fiscal year? Please state assessed valuation in each county of this State, and also whether the taxes assessed have been paid.

NOTE.—For answer please refer to annexed schedule, the aggregates of which are as follows:

Value of railroad.....	\$23,485,629 00
Value of other property.....	5,431,665 00
Total value.....	28,916,694 00
Taxes charged.....	475,653 41
Taxes paid.....	236,337 57

SCHEDULE

Showing the value of property by counties assessed to the Central Pacific Railroad Company, leased lines, etc., for the year 1882, in California; the amount of taxes charged against the same, and the amount of taxes paid:

	Valuation.	Amount Taxes Charged.	Amount Taxes Paid.
Alameda.....	\$2,980,364	\$35,731 61	\$7,146 77
Alpine.....			
Amador.....	54,008	1,317 18	1,317 18
Butte.....	1,138,760	17,862 41	17,862 41
Calaveras.....	6,160	154 00	154 00
Colusa.....	740,764	10,412 02	3,972 02
Contra Costa.....	630,120	10,807 75	542 65
Del Norte.....			
El Dorado.....	157,838	3,377 73	3,377 73
Fresno.....	1,320,779	23,843 72	1,770 59
Humboldt.....			
Inyo.....			
Kern.....	1,542,200	30,844 00	30,844 00
Kern.....	38,500	770 00	770 00
Lassen.....			
Los Angeles.....	2,027,475	28,919 89	7,687 63
Marin.....			
Mariposa.....			
Mendocino.....			
Merced.....	699,607	14,168 79	14,168 79
Modoc.....			
Mono.....			
Monterey.....			
Napa.....	538,300	9,586 36	97 70
Nevada.....	965,530	16,956 58	13,511 87
Placer { D. No. 1 }	2,940,525	47,129 00	30,373 43
Placer { D. No. 2 }			
Placer { D. No. 3 }			
Plumas.....	3,910	97 75	97 75
Sacramento.....	1,849,044	31,691 16	12,704 66
San Benito.....			
San Bernardino.....	649,727	10,915 42	1,283 97
San Diego.....	1,688,650	24,485 43	24,485 43
San Francisco.....	934,789	16,818 79	12,882 57
San Joaquin.....	1,847,110	22,756 41	771 82
San Luis Obispo.....			
San Mateo.....	1,255	20 10	20 10
Santa Barbara.....			
Santa Clara.....	230,700	4,125 21	26 04
Santa Cruz.....			
Shasta.....	490,288	13,176 88	5,688 86
Sierra.....	70,290	1,968 12	1,968 12
Siskiyou.....			
Solano.....	719,950	13,174 94	556 92
Sonoma.....			
Stanislaus.....	545,442	7,720 29	992 28
Sutter.....	164,878	2,966 00	341 00
Tehama.....	1,112,142	18,872 14	8,838 49
Trinity.....			
Tulare.....	1,753,444	33,593 27	17,166 63
Tuolumne.....			
Ventura.....			
Yolo.....	741,980	12,236 06	12,236 06
Yuba.....	332,165	9,154 40	2,680 10
Total.....	\$28,916,694	\$475,653 41	\$236,337 57

Seventh—Please furnish a schedule of the rates of fare and freight charged by you in this State?

Answer—Full line of schedules has been sent to W. R. Andrus, Secretary of the Board.

Eighth—How much of your gross earnings came from local passengers? How much from local freights?

Answer—Gross earnings from the entire system of local passengers in 1882 were \$4,980,370 51; and from local freights, \$12,340,777 31.

Our statistics are not made up so as to show how much of each was in the State of California.

SALARIES.

Ninth—What were your total expenses for salaries to employes for the year 1882? Please state the names, official designations, and salaries of every person in your employment, in any capacity whatever, who receives as much or more than \$5,000 per annum.

Answer—The amount paid to employes for salaries during the year 1882 was \$8,213,130 80, of which there were twenty-three persons who received as much as or more than \$5,000 per annum. This amount in the aggregate was \$214,800, or an average of \$9,339 13.

RENTS PAID FOR LEASED LINES.

Tenth—What amount of money do you pay as rent for each of your leased lines? Please state the rent per mile as well as the gross sum for each line.

Answer—Below please find statement in detail:

	Per Mile.	Amount.
Southern Pacific Railroad of California.....	\$250 00	\$1,650,600 00
Southern Pacific Railroad of Arizona.....	135 00	622,355 40
Southern Pacific Railroad of New Mexico.....	135 00	270,896 40
Los Angeles and San Diego Railroad.....	100 00	33,384 00
Los Angeles and Independence Railroad.....	100 00	20,196 00
Amador Branch.....	154 41	42,000 00
Berkeley Branch.....	200 00	9,216 00
Sacramento and Placerville Railroad (between Sacramento and Brighton).....	1,440 00	7,200 00
California Pacific Railroad.....	5,194 00	600,000 00
Stockton and Copperopolis Railroad.....	510 00	25,000 00
Union Pacific Railway Company (between Promontory and Ogden), based on net earnings per mile.....		46,595 65
Northern Railway—\$300 per mile to Willows, \$150 per mile above Willows.....		590,617 20
Southern Pacific, east of Mojave.....	125 00	16,066 00
Galveston, Harrisburg and San Antonio Railway, \$83 33 per mile.....		\$296,759 24
Less paid Texas and Pacific Railway.....	\$54,900 00	241,859 24
Colorado River bridge, \$1,000 per month.....		12,000 00
Rio Grande River bridge, \$1,000 per month.....		12,000 00
Total.....		\$4,199,985 89

Of this amount there is properly chargeable to the previous year, \$2,741 95.

The above questions and answers pertain to Circular No. 1—the following to Substitute No. 2.

"In addition to the information heretofore requested of you, we desire further statements and exhibits showing:

"*First (B)*—The name and principal place of business of your railroad company."

Answer—

Central Pacific Railroad Company of California.
 California Pacific Railroad Company.
 Stockton and Copperopolis Railroad Company.
 San Pablo and Tulare Railroad Company.
 Northern Railway.
 Amador Branch Railroad Company.
 Berkeley Branch Railroad Company.
 Southern Pacific Railroad Company of California.
 Southern Pacific Railroad Company of Arizona.
 Southern Pacific Railroad Company of New Mexico.
 Los Angeles and San Diego Railroad Company.
 Los Angeles and Independence Railroad Company.

Principal place of business, San Francisco, California.

THE GENERAL SYSTEM OF ROADS OUTLINED.

"*Second (B)*—A general description of the line or system of railroads it owns and operates.

"*Third (B)*—The same of its road or roads within this State."

Answer—To these two questions we beg to submit a graphic answer in the form of a blue printed map, twenty-six feet long, exhibiting the general physical characteristics of all lines (owned or leased) operated by the Central Pacific Railroad Company west of Ogden, Utah, and El Paso, Texas, excepting the new lines, for which our engineers have not yet been able to compile the necessary data, viz.: the extension of the Northern Railway from Willows to Tehama, recently completed, and the Colorado Division of the Southern Pacific, now under construction, from Mohave to the Needles, on the Colorado River.

Please note that the map in question bears profiles of the respective lines (on scales of ten miles to the inch horizontal, and one thousand feet to the inch vertical), the names of all stations, and the elevations of same in feet and hundredths above the sea level; the distance between stations in miles and hundredths of a mile; the maximum grade between stations in feet per mile, and the length of curved line in miles, divided to show, for short section of each road, the aggregate length of curves under six degrees, those between six and eight degrees, and those from eight to ten degrees, the latter rate of curvature being the maximum; the location of all fuel stations, water stations, station buildings (depots), track scales, stock corrals, turn-tables, engine houses, and section (track) houses are also indicated on face of the map.

INTER-STATE CONNECTIONS.

"*Fourth (B)*—The inter-State connections of the overland roads and their local relations to each other and to their respective feeders and branches."

Answer—The inter-State connections with the overland roads are as follows: The Central Pacific connects with the Union Pacific, the

Utah and Northern and the Utah Central at Ogden; with the Eureka and Palisade Railroad at Palisade; with the Nevada Central at Battle Mountain; with the Virginia and Truckee and Nevada and Oregon Railroads at Reno.

The Southern Pacific connects with the California Southern Railway at Colton; with the Sonora Railroad at Benson; with the Atchison, Topeka, and Santa Fé Railroad at Deming; with the Galveston, Harrisburg, and San Antonio Railway, and Texas and Pacific Railway at El Paso.

The inter-State connections, in their local relations, are independent of each other, except that through rates are frequently made on low-class freights to develop the particular resources of localities which they serve; and the same is applicable to the feeders and branches within this State.

DIFFERENTIAL RATES.

"*Fifth (B)*—The reason, if any, for differential rates on a system of coöperating roads."

Answer—Assuming that the term "coöperating" means "branch," in this connection, there are many reasons why rates on branch roads should be higher than on main lines. Among these we may state that the cost per ton of moving freight over a road is in inverse ratio to the amount carried.

In operating a short road, with limited traffic, the fixed expenses (by which are meant interest, taxes, station expense, renewals of perishable property, such as ties, fences, etc.), are the same, regardless of the amount of freight moved, the motive power being a comparatively small part of the cost of the service; and thus, where the volume of business is small, the cost per mile is correspondingly high.

BRANCH ROADS AND MAIN LINES.

"*Sixth (B)*—The extent to which such feeders and branches are dependent for continued existence and operation upon the trade and travel tributary to each."

Answer—Branch roads, in most cases, could not exist in California without main lines; and the extent to which this is true is evidenced by the following showing of the gross earnings and expenses of three branches operated by this company, although in each case, in apportioning earnings on joint business at through rates, the branch roads are allowed two miles for each mile of the main line:

<i>Amador Branch—</i>		
Gross earnings.....		\$50,692 77
Operating expenses and interest on bonded debt		61,203 05
Loss		\$10,510 28
<i>Los Angeles and San Diego Railroad—</i>		
Gross earnings.....		\$52,695 04
Operating expenses and interest on bonded debt.....		72,928 08
Loss		\$20,233 04
<i>Los Angeles and Independence Railroad—</i>		
Gross earnings.....		\$15,461 71
Operating expenses and interest on bonded debt		36,784 65
Loss		\$21,322 94

The Sacramento and Placerville Railroad, though not operated by the Central Pacific, is dependent upon it to a certain extent; and joint rates are made which will allow the short road higher rates per mile than the longer one.

The same is true of the Vaca Valley and Clear Lake road.

The same constructive mileage is allowed the Stockton and Copperopolis Railroad; but, though it runs through a good country, its receipts are barely sufficient to cover running expenses and interest.

REPAIRS AND EXTENSIONS COME OUT OF EARNINGS.

*"Seventh (B)—*The ways and means for repairs, renewals, betterments, and extensions necessary to the safety, public use, and continued operation of such feeders and branches, or any of them."

*Answer—*The ways and means for repairs (renewals) and betterments necessary to, the safety, public use, and continued operation of such branch lines, must come from the earnings, as there is no other source from which they can be obtained.

The means for extensions, branch lines, or feeders must come from those seeking a safe place for their surplus capital. This may come from large, but more likely from small, investors, desirous of placing their means in some permanent and paying security. Therefore, confidence in the ability of the property to earn a sufficient amount to meet the obligations is an absolute necessity, which confidence is liable to be shaken unless the rate-making power of the traffic is vested in conservative hands, with no less responsibility than that devolving upon a trustee legally and honorably bound to protect the property of others.

COMPETITION.

*"Eighth (B)—*Of what section and what proportion of the population and productions of the State is your road, or system of roads, the only means of transportation?"

*Answer—*A glance at the map will show that this State is favored with water transportation not only on the seaboard, but also by the Sacramento and San Joaquin Rivers, which drain the two principal valleys of the State. The only sections for which our system of roads is the only means of transportation are in the extreme north and southeast and the mountain districts.

A statement is herewith appended showing the population of California, by the census of 1880, the acreage and assessed average value per acre in 1882, the mileage of the Central Pacific system of roads in each county, and the percentage of the whole population and whole acreage served by our roads.

From this it will appear that 666,000, or 77 per cent of the population, are in counties through which the roads run, and that over 17,000,000, or nearly 67 per cent of the whole acreage, are in these counties.

STATEMENT

Showing population of California in 1880; acreage and average assessed value per acre, 1882; Central Pacific and Southern Pacific railroad mileage, 1882; and percentage of whole population and whole acreage directly served:

COUNTIES.	Population— Census 1880.	No. Acres As- sessed, 1882.	Average Value per Acre, 1882.	Miles Operated by C. P. and S. P. R. R. Co's.
Alameda	62,976	416,821	\$26 36	91.77
Alpine	539	32,134	4 25	-----
Amador	11,384	200,402	4 42	8.00
Butte	18,721	669,826	10 62	45.00
Calaveras	9,094	230,211	4 21	0.66
Colusa	13,118	1,093,669	10 79	46.00
Contra Costa	12,525	455,391	11 03	59.85
Del Norte	2,584	66,562	4 40	-----
El Dorado	10,683	207,793	4 44	-----
Fresno	9,478	1,703,800	2 47	78.99
Humboldt	15,512	791,859	3 71	-----
Inyo	2,928	66,789	4 10	-----
Kern	5,601	1,117,421	1 80	117.83
Lake	6,596	200,608	5 25	-----
Lassen	3,340	132,180	3 81	-----
Los Angeles	33,381	1,334,251	5 78	142.48
Marin	11,324	320,574	12 07	-----
Mariposa	4,339	222,013	2 88	-----
Mendocino	12,800	774,512	3 78	-----
Merced	5,656	1,021,323	3 39	36.75
Modoc	4,399	207,713	2 39	-----
Mono	7,499	82,913	16 68	-----
Monterey	11,302	901,772	4 93	-----
Napa	13,235	326,229	11 76	41.00
Nevada	20,823	229,526	12 59	30.25
Placer	14,232	330,655	5 62	112.75
Plumas	6,180	213,068	3 93	-----
Sacramento	34,390	606,759	9 00	60.50
San Benito	5,584	312,178	7 38	-----
San Bernardino	7,786	416,766	3 84	54.60
San Diego	8,618	960,908	2 26	158.85
San Francisco	233,959	27,000	35 56	4.00
San Joaquin	24,349	866,835	17 56	98.06
San Luis Obispo	9,142	944,790	2 71	-----
San Mateo	8,669	290,531	13 15	-----
Santa Barbara	9,513	981,252	2 46	-----
Santa Clara	35,039	558,590	18 30	8.50
Santa Cruz	12,802	245,253	10 66	-----
Shasta	9,492	329,724	2 62	18.80
Sierra	6,623	84,136	8 83	2.15
Siskiyou	8,610	191,683	6 10	-----
Solano	18,475	501,429	13 09	56.75
Sonoma	25,926	753,525	11 58	-----
Stanislaus	8,751	763,507	8 96	33.79
Sutter	5,159	372,082	7 32	10.00
Tehama	9,301	898,712	4 17	40.54
Trinity	4,999	92,465	4 48	-----
Tulare	11,281	1,166,579	3 48	74.63
Tuolumne	7,848	192,837	3 31	-----
Ventura	5,073	455,743	3 78	-----
Yolo	11,772	556,157	13 92	51.75
Yuba	11,284	283,166	4 55	16.29

DEDUCTIONS.

Total population	864,694
Population of counties through which roads of Central Pacific and Southern Pacific Railroad Companies pass	666,503
Percentage of whole population directly served by Central Pacific and Southern Pacific Railroad Companies	77.1
Total acreage of State	26,252,622
Acreage of counties through which roads of Central Pacific and Southern Pacific Railroad Companies pass	17,571,875
Percentage of whole acreage directly served by Central Pacific and Southern Pacific Railroad Companies	66.9
Average assessed value of land per acre	\$6 88

LIST OF COMPETITIVE POINTS.

"Ninth (B)—At what points along its main line within this State does it meet with rival carriers by rail, river, or ocean, and for what percentage of its gross earnings does it compete with them?"

Answer—The Central Pacific Railroad and leased lines come into direct competition with other carriers, rail or water, at the following points, seventy-one in number:

San Francisco (Market Street).....	San Francisco Bay, Sacramento River and sloughs
Oakland Pier.....	San Francisco Bay, Sacramento River and sloughs
Oakland Wharf.....	San Francisco Bay, Sacramento River and sloughs
Stock Yards.....	San Francisco Bay, Sacramento River and sloughs
Standard Soap Company's switch.....	San Francisco Bay, Sacramento River and sloughs
Emerys.....	San Francisco Bay, Sacramento River and sloughs
Highland.....	San Francisco Bay, Sacramento River and sloughs
Point Isabel.....	San Francisco Bay, Sacramento River and sloughs
Steger.....	San Francisco Bay, Sacramento River and sloughs
Barrett.....	San Francisco Bay, Sacramento River and sloughs
San Pablo.....	San Francisco Bay, Sacramento River and sloughs
Flint.....	San Francisco Bay, Sacramento River and sloughs
Sobrante.....	San Francisco Bay, Sacramento River and sloughs
Pinole.....	San Francisco Bay, Sacramento River and sloughs
Powning.....	San Francisco Bay, Sacramento River and sloughs
Tormey.....	San Francisco Bay, Sacramento River and sloughs
Vallejo Junction.....	San Francisco Bay, Sacramento River and sloughs
Valona.....	San Francisco Bay, Sacramento River and sloughs
Crocketts.....	San Francisco Bay, Sacramento River and sloughs
Granger Siding.....	San Francisco Bay, Sacramento River and sloughs
Port Costa.....	San Francisco Bay, Sacramento River and sloughs
Martinez.....	San Francisco Bay, Sacramento River and sloughs
Avon.....	San Francisco Bay, Sacramento River and sloughs
Bay Point.....	San Francisco Bay, Sacramento River and sloughs
McAvoy.....	San Francisco Bay, Sacramento River and sloughs
Los Medanos.....	San Francisco Bay, Sacramento River and sloughs
Empire Railroad Crossing.....	San Francisco Bay, Sacramento River and sloughs
Antioch.....	San Francisco Bay, Sacramento River and sloughs
Cornwall.....	San Francisco Bay, Sacramento River and sloughs
West Oakland.....	San Francisco Bay and Oakland Creek
Oakland (Market Street).....	San Francisco Bay and Oakland Creek
Alameda Point.....	San Francisco Bay and South Pacific Coast Railroad
Bay Street.....	South Pacific Coast Railroad
Alameda.....	South Pacific Coast Railroad
Fernside.....	South Pacific Coast Railroad
East Oakland.....	South Pacific Coast Railroad
Park Street Crossing.....	South Pacific Coast Railroad
Fruit Vale.....	South Pacific Coast Railroad
Melrose.....	South Pacific Coast Railroad
Mitchell.....	South Pacific Coast Railroad
San Leandro.....	South Pacific Coast Railroad
Lorenzo.....	South Pacific Coast Railroad
Haywards.....	South Pacific Coast Railroad
Alvarado.....	South Pacific Coast Railroad
Decoto.....	South Pacific Coast Railroad
Niles.....	South Pacific Coast Railroad
Washington.....	South Pacific Coast Railroad
Warm Springs.....	South Pacific Coast Railroad
Milpitas.....	South Pacific Coast Railroad
Wayne.....	South Pacific Coast Railroad
San José.....	South Pacific Coast Railroad
Benicia.....	San Francisco Bay and Sacramento River
Suisun.....	Suisun Bay and San Francisco Bay
Army Point.....	Suisun Bay and San Francisco Bay
South Vallejo.....	San Francisco Bay
Thompson's.....	San Francisco Bay
Napa.....	Napa River
San Joaquin Bridge.....	San Joaquin River
Stockton.....	San Joaquin River

Lodi.....	S. N. and S. J. Railroad and Sacramento River
Sacramento.....	Sacramento River
Knight's Landing.....	Sacramento River
Marysville.....	Feather River
Tehama.....	Feather River
Chico.....	Sacramento River
Red Bluff.....	Sacramento River
Santa Monica.....	Pacific Ocean
San Pedro.....	Pacific Ocean
Wilmington.....	Wilmington Bay and Pacific Ocean
Colton.....	California Southern Railroad
Yuma.....	Colorado River and Pacific Ocean

At the following eighty-two points on the Central Pacific Railroad and leased lines rates are directly affected by reason of proximity to the competitive points named above, or by the law which requires that rates for short distances to intermediate points shall not exceed those to greater distances in the same direction within the State:

Brentwood.....	San Francisco Bay, Sacramento River, and sloughs
Byron.....	San Francisco Bay, Sacramento River, and sloughs
Bethany.....	San Francisco Bay, Sacramento River, and sloughs
Tracy.....	San Francisco Bay, Sacramento River, and sloughs
Goodyears.....	San Francisco and Suisun Bays
Teal.....	San Francisco and Suisun Bays
Napa Junction.....	Napa River
Middleton.....	Napa River
Banta.....	San Joaquin River
Lathrop.....	San Joaquin River
French Camp.....	San Joaquin River
Galt.....	S. N. and S. J. Railroad and Sacramento River
Acampo.....	S. N. and S. J. Railroad and Sacramento River
McConnells.....	Sacramento River
Elk Grove.....	Sacramento River
Florin.....	Sacramento River
Brighton.....	Sacramento River
Loma.....	Feather River
Live Oak.....	Feather River
Gridley.....	Feather River
Biggs.....	Feather River
Nord.....	Sacramento River
Ceres.....	Sacramento River
Soto.....	Sacramento River
Vina.....	Sacramento River
Sesma.....	Sacramento River
Woodland.....	Sacramento River
Blacks.....	Sacramento River
Dunnigans.....	Sacramento River
Harrington.....	Sacramento River
Arbuckle.....	Sacramento River
Berlin.....	Sacramento River
Macy.....	Sacramento River
Willows.....	Sacramento River
Maxwell.....	Sacramento River
Delavan.....	Sacramento River
Logandale.....	Sacramento River
Willows.....	Sacramento River
Lyman.....	Sacramento River
Germantown.....	Sacramento River
Greenwood.....	Sacramento River
Orland.....	Sacramento River
Malton.....	Sacramento River
Kirkwood.....	Sacramento River
Corning.....	Sacramento River
Richfield.....	Sacramento River
Finnell.....	Sacramento River
Anaheim.....	Via Anaheim Landing and Pacific Ocean
Santa Ana.....	Via Anaheim Landing and Pacific Ocean

Los Angeles and all stations north thereof are affected by reason of the competition with ocean route from San Pedro as follows:

Sepulveda,	San Fernando,	Newhall,	Lang,	Ravenna,	Acton,
Alpine,	Lancaster,	Sand Creek,	Gloster,	Mojave,	Nadeau,
Cameron,	Tehachapi,	Girard,	Keene,	Bealville,	Caliente,
Pampa,	Sumner,	Lerdo,	Poso,	Delano,	Alila,
Tipton,	Tulare,	Huron,	Heinlen,	Lemoore,	Hanford.
Goshen,	Cross Creek,				

SPECIAL CONTRACTS.

"*Tenth* (B)—What are the alleged special contracts, or underbidding system of contracts at such competitive point or points, under which your company performs stipulated service for contracting shippers on terms not open to all rival shippers and carriers?"

Answer—There are no special contracts with local shippers; that is, on freight moved within the State.

The company is concerned in special contracts made by eastern roads with shippers who agree to use the overland lines, exclusively, as against the ocean routes; but no such contracts are made between points within this State.

"*Eleventh* (B)—State the average difference, if any, between contract and competitive rates for equivalent service at such points. A sample copy of such contract is requested."

Answer—Copies of overland contracts and of rates to contractors and non-contractors, herewith.

It is impossible to strike an average difference, but the rates show for themselves.

"*Twelfth* (B)—Approximate the average difference between such special rates at such points and schedule rates at non-competitive points."

NOTE.—The replies to Nos. ten and eleven.

AVERAGE RATES OF FREIGHT PER MILE IN 1881.

"*Thirteenth* (B)—From a comparative estimate, what are the relative average rates of through and local freights?"

Answer—This query cannot be answered for the year 1882, as tonnage statistics cannot be compiled till about May first.

In 1881 the average rate per ton per mile on through freight was 1.667 cents, and on local freight, 3.215 cents.

"*Fourteenth* (B)—When and why are both collected, if at all, on through shipments to and from non-competitive points?"

Answer—This is not done. Non-competitive points are given the benefit of lowest through rates to nearest competitive point, in proportion to their proximity to such points, when this is lower than local rates between eastern cities and such non-competitive points.

"*Fifteenth* (B)—What is the total income for the year ending December 31, 1882, of your road in California, from local freights on through shipments?"

NOTE.—As explained in preceding answer, no such charges were made.

JOINT EARNINGS.

"*Sixteenth* (B)—What share of joint earnings from through freights,

pro rata with its overland connections, is received by your road in California?"

Answer—Earnings by our road in California on through freights, pro rata with overland connections, were as follows, being less than thirty-nine per cent of the whole.

West-bound through freights:

	California Proportion of Charges.	Total Central Pa- cific Proportion of Through Charges.
Via Union Pacific.....	\$633,044 22	\$2,009,630 80
Via Atchison and Topeka.....	158,742 75	294,533 98
Via Texas Pacific.....	50,685 58	93,656 61
Total.....	\$842,472 55	\$2,397,830 39

East-bound through freights:

	California Proportion of Charges.	Total Central Pa- cific Proportion of Through Charges.
Via Union Pacific.....	\$220,897 43	\$728,037 48
Via Atchison and Topeka.....	210,667 98	360,407 99
Via Texas Pacific.....	266,041 97	475,829 55
Total.....	\$697,607 48	\$1,564,275 02
Grand Total.....	\$1,540,079 93	\$3,961,275 41

"*Seventeenth* (B)—What, for the year last mentioned, were its total earnings from freights of all classes?"

Answer—\$16,302,882 72.

"*Eighteenth* (B)—What, for the same year, were its total operating expenses of the freight department?"

Answer—This query, with numbers 22, 23, 24, 25, and 26, which are all of the same nature, cannot be answered by this or any railroad company doing freight and passenger traffic on the same line of rails.

It is admitted by the best railroad accountants that any estimate or system of division of each class of traffic made for such a road would be only approximate, and might be very far from correct.

The truth of this will be apparent when we remember that the volume, direction, and condition of movements of freight (all of which affect the cost), are constantly fluctuating; and the same is true, though in a more limited sense, of passenger business, the lower classes of which are sometimes hauled in mixed trains.

The company does not attempt to segregate the cost of each class of traffic, and therefore cannot give the percentages of expenses in each department.

RELATIVE COST OF SERVICE.

"*Nineteenth* (B)—How far does the relative cost of service in the freight and passenger departments of your road control the rates of charges for fares and freights?"

Answer—The relative cost of service being unknown (see answer to queries Nos. 19, 22, 23, 24, 25, and 26), it follows that other consid-

erations must control the rates of charges for fares and freights. To show all these would be to enter a broad and important field of political economy too wide for the limits of this extended communication. It is a subject, however, which I shall be pleased to discuss further with you at some future time, and which I trust will receive, as it deserves, your careful study.

PASSENGER RATES PER MILE.

"*Twentieth* (B)—What are the maximum and minimum and average rates per mile for through passengers on your road in this State?"

Answer—Presuming that this question refers to overland traffic, which has always been designated as "through," maximum is 5.2 cents per mile; minimum is 1.6 cents per mile. The average rate of fare per mile cannot be given, excepting that we may be allowed to quote our general average rate per mile for our whole system during the year 1881; *i. e.*, 3.06.

"*Twenty-first* (B)—The same for local passengers, excluding fares of Oakland ferry?"

Answer—The local rates in this State, excluding fares of the Oakland ferries, are, maximum, 10 cents; minimum, 1.4 cents.

The average rate per mile for 1882 cannot now be given; but for the year 1881, we find it was 3.94 cents per mile, while including the Oakland ferry traffic for the same year, it was 2.68 cents.

"*Twenty-second* (B)—What is the percentage of expense to earnings from each class of passengers, and percentage of net income from each to total operating expenses incurred for both?"

Answer—Refer to "answer" given for eighteenth question.

"*Twenty-third* (B)—Percentage of expenses to earnings in passenger department?"

Answer—Refer to "answer" given for eighteenth question.

"*Twenty-fourth* (B)—Percentage of expenses to earnings in freight department?"

Answer—Refer to "answer" given for eighteenth question.

"*Twenty-fifth* (B)—Percentage of total expense to total earnings in both departments?"

Answer—Refer to "answer" given for eighteenth question.

"*Twenty-sixth* (B)—Percentage of net income in each to total net earnings in both?"

Answer—Refer to "answer" given for eighteenth question.

FURTHER INFORMATION WANTED.

Severe illness having greatly interfered recently with the prosecution of my official duties, I regret that I could not have given more of my personal attention to the matter embraced in these questions. A desire to comply with the Board's wishes, for presentation of the answers at the next meeting, might be offered as further apology for any possible omissions or apparent incompleteness of requested information.

At the same time, I will add, that any additional queries it may be the pleasure of your honorable Board to make, will receive prompt attention by,

Very respectfully,

A. N. TOWNE, General Manager.

APRIL 16, 1883.

To the honorable Board of State Railroad Commissioners:

GENTLEMEN: May I take the liberty of referring your honorable Board to a communication under date of February twentieth last, from our General Manager, A. N. Towne, answering certain questions embraced in Circular No. 2, adopted and issued February 5, 1883. Wishing to state, that being now able so to do, we desire to give more explicit answers to the following numbers:

"*Twentieth* (B) page 35—What are the average rates per mile for through passengers for 1882?"

Answer—Average number of miles traveled by each passenger, 33.27; average charge per mile per passenger, in cents, 2.92.

"*Twenty-first* (B)—The same for local passengers for 1882?"

Answer—Local travel in this State, including ferries. Total number of passengers, 7,366,525; total miles, 124,809,648; total earnings, \$3,189,399 74; average number of miles traveled by each passenger, 16.94; average charge per mile per passenger, in cents, 2.56.

Same, excluding fares of the Oakland ferries: Total number of passengers, 1,471,366; total miles, 70,206,844; total earnings, \$2,613,165 79; average number of miles traveled by each passenger, 47.72; average charge per mile per passenger, in cents, 3.72.

The above figures show percentages of decrease in fares received during 1882, as compared with similar receipts for 1881, as follows: For whole system of roads, 4.6 per cent; for the State, 4.5 per cent; for latter, excluding ferries, 5.6 per cent.

Very respectfully, your obedient servant,

T. H. GOODMAN, G. P. and T. Agent.

APPENDIX B.

To the honorable the Board of Railroad Commissioners of the State of California:

GENTLEMEN: On behalf of the Central Pacific Railroad Company I have the honor to acknowledge the receipt of a copy of the order adopted by your honorable body on the twenty-sixth day of June, ultimo, prescribing the rates of passenger fares on the system of railroads owned and leased by it.

The order establishes a maximum of six cents per mile on the desert and mountain portions of the system, and four cents per mile in the valley districts, and adopts all lower rates now charged by us.

This official order works many radical changes in the rates of passenger transportation, and we respectfully enter this our solemn protest against its enforcement, and for grounds of protest beg leave to respectfully submit the following:

GROUNDS OF PROTEST.

First—The State of California, neither through its Legislature nor through you, its Board of Railroad Commissioners, has jurisdiction to regulate fares and freights upon either the Central or Southern Pacific Railroad. Both of these roads, as you are aware, have been constructed under Acts of Congress—the former under the Act of Congress of July 1, 1862, in relation to the Union and Central Pacific Railroads—the latter under two Acts of Congress, to wit: the Atlantic and Pacific Railroad Act of July 27, 1866, and the Act in relation to the Texas and Pacific Railway Company of March 3, 1871. By the eighteenth section of the first of said Acts Congress reserved to itself the power to regulate fares and freights upon the Central Pacific Railroad, after the income of said road should exceed ten per cent upon the cost of its construction, exclusive of the five per centum required to be paid by the company to the United States in liquidation of the loans made by the United States to it, and in the meantime authorized the company to establish its own rates.

By the thirteenth section of the second of said Acts it was provided that the Directors of the Southern Pacific Railroad Company might, from time to time, fix, determine, and regulate the fares, tolls, and charges to be received and paid for transportation of persons and property on its road or any part thereof.

The fifteenth section of the third and last of said Acts provided that the rates charged for carrying passengers and freight per mile shall not exceed prices which might be fixed by Congress for carrying passengers and freight on the Union Pacific and Central Pacific Railroads; and, by the nineteenth section thereof, it was further provided that no act of the company, nor any law of any State or Territory, should impede, delay, or prevent the company from performing its obligations to the United States.

JURISDICTION RESERVED BY CONGRESS.

Thus it appears that Congress has reserved to itself full and complete jurisdiction over the regulation of fares and freights, upon both the roads in question, and has already, in a measure, exercised such jurisdiction. To this jurisdiction, on the part of the National Government, the State of California, by solemn Acts of its legislative body, has fully assented, if such assent was necessary, which we deny.

Said Acts were directed by a wise policy on the part of Congress. The purpose of Congress, in the passage of said Acts, was to promote the settlement and development of the country, and to stimulate and encourage the construction of lines of communication between all parts of the national domain.

The action proposed by you, and against which we protest, is at variance with this broader policy of the National Government; indeed, it will prove, if enforced, the reversal of that policy, by arresting the construction of transportation lines, and thereby retarding the development of the national resources, and delaying the progress of civilization.

Second—The rates proposed to be established by this order will supplant and nullify schedules for passenger transportation, in all respects just and reasonable to the public and equitable to our roads.

Third—The order is an unlawful interference with that liberty of action which all enlightened governments are bound to accord to their citizens.

Fourth—The rates established by us, and which the enforcement of the order will modify and supplant, do not constitute an abuse calling for remedy by the interposition of the legislative, executive, or judicial function, alleged by some persons, but denied by others, to be vested in your honorable body.

Fifth—The rates established by us, and proposed to be abolished by your order, were produced by the natural reciprocal relation of the lower with the higher rates subsisting, and in force upon the various portions of our railroad system.

Sixth—It is undeniable that the standard from which the reductions of maximum rates were made by you was that adopted by us. But, in utter disregard of the reasons influencing the establishment of maximum rates and the relation of minimum rates thereto, you have reduced the maximum without permitting an increase of the minimum rates, with which such maximum rates were correlated, when the scale of rates were established by us.

THE SWEEPING SCHEDULE.

Seventh—We further protest, on the general grounds, that there is no well founded justification for reductions, which, in the language of one of the members of your honorable body, "are probably the most sweeping ever made by one schedule in any State," and because the order is largely due to uninformed and unreasoning clamor on the part of persons absolutely ignorant of the equitable principles upon which transportation services should be rendered.

Eighth—We further protest, because, during the investigations and proceedings which have culminated in the order in question, undue

weight has been given to the oft-repeated misrepresentation that the roads singled out for regulation were constructed at the public expense, while, in fact, every one at all familiar with the legislative history of the country well knows that they were constructed under contracts made between their builders and the United States, at the earnest solicitation and with the eager and unqualified approbation of the State of California.

Ninth—We further protest, because your tribunal—judicial, legislative, and executive in its character—uniting, therefore, those powers which modern statesmanship has wisely assigned to separate departments of government, in respect to all citizens, except such as are engaged in the business of transportation—has been made the forum of unchallenged and unrebuked falsifications and disgraceful attempts at coercion.

OBSERVERS OF THE AGITATION.

Of the "agitation" which has preceded the definite action of your Commission, we have been careful observers. We have noted the varied and ingenious agencies which have been active in influencing the conclusions to be reached by your honorable Board. County committees have assumed to dictate to you the exact manner in which the functions of your office should be performed. Preambles and resolutions, prepared and adopted without regard to law or logic, but always denunciatory of "recreant Commissioners," have been formulated by aspiring place-hunters, and given prominence in the columns of a press under the influence or control of selfish schemers, whose only desire has been or is to promote individual aggrandizement.

Public meetings have been called, which, in view of the number and character of the persons present, were a rebuke to their promoters. An unprincipled and communistic press exaggerated the importance of these gatherings and industriously magnified the numbers in attendance.

The county committees and public meetings have represented to the Chief Executive of the State that members of your Commission should be impeached, and have demanded of his Excellency that he should forthwith convene the Legislature in special session that the trial might proceed without delay. The halter and the stake, border ruffianism, and mob violence have been threatened by those whose sworn duty it is to administer and uphold the law. Members of the Legislature, forgetting that they might be called to sit as impartial judges on such a possible trial, have shown an indecent haste to record their verdict and to pronounce their judgment long in advance of a hearing.

EFFORTS AT COERCION.

You, as Commissioners, have essayed to perform the functions of your high and responsible office in the midst of these turbulent and unseemly proceedings. You have attempted to investigate the most important and intricate question that can tax the ingenuity of man while experiencing these disgraceful efforts at coercion. In your very Court-room, and while in session, you have been called upon to administer equity—according to their notions of equity—by the advocates of mob law, by the violators of law and decency.

We submit that it is impossible for any public officer to hold the scales of justice even when surrounded by circumstances, conditions, and influences such as these.

It has been our constant aim so to conduct our business as to be at peace with the patrons of our lines. Any one brought into business relations with us having a grievance, real or fancied, has always been able to obtain a patient hearing and prompt redress, if redress comported with business principles. That we have been reasonably successful in establishing good relations with the great body of our patrons is proved by their non-participation in the coercive efforts which, we insist, have influenced the judgment and determination of your Commission. The representative merchants, manufacturers, laborers, skilled and unskilled, as we believe, have taken no part in the agitation by which designing persons have attempted to make outlaws of a majority of your Commission.

BRANCH LINES TO RICH VALLEYS.

It is well known that it has been our purpose to construct branch lines into some of the rich valleys of the State, into which, as yet, no railway has penetrated, and which are, therefore, comparatively isolated, for the want of transportation facilities. Indeed, in some cases, our intentions have been partially executed. Napa County merits an increase of railway mileage, by which Lake County, also, would be greatly benefited. The time and expense now required for a visit to Yosemite can and ought to be lessened, but this can be done only by railway construction. The extensive valley of the San Joaquin is inadequately provided with railway advantages. An extension of the line from Soledad southerly through the Counties of San Luis Obispo, Santa Barbara, and Ventura, as soon as trunk lines are completed, would vastly improve those sections of the State, and speedily quadruple the population and taxable property thereof.

These and other branch lines have had the earnest consideration of the builders of the Central and Southern Pacific roads, and for some of them lines have been surveyed; and in respect to others, more advanced preparations have been made for their early construction.

All these projects must now be abandoned, or postponed, until those who are invested by the Constitution with the power to regulate our affairs, are allowed by all persons to exercise the functions of their office without fear of political ostracism.

We are not now, nor have we ever been, apprehensive of serious evil from an enlightened, unprejudiced, and untrammelled Commission.

All of which is respectfully submitted.

A. N. TOWNE,
General Manager Central Pacific Railroad and leased lines.

APPENDIX C.

JULY 6, 1883.

To the honorable the Board of Railroad Commissioners, State of California:

SIRS: In response to your order of the twenty-ninth of June, the Central Pacific Railroad Company, by its Freight Traffic Manager and General Freight Agent, appeared before your honorable Board on the twenty-seventh ultimo to protest against the action contemplated by your Commission in the matter of reducing the freight rates of this company.

It now begs to submit, in writing, the reasons given at said interview, with additional arguments against said action.

It respectfully urges upon your Commission that the spirit and purpose of the organization of a State Board of Railroad Commissioners was to remove the question of regulation of freights and fares from the stump of political campaigns—taking it out of politics, from being forced upon the overburdened Legislature, whose time, knowledge, and experience did not qualify it to deal with the subject, and refer it to the thoughtful consideration of a Board which should study the question with disinterested motives, and act upon exact knowledge, or from data gathered from the many sources of information which the vast railroad system of the nation and the experience of kindred bodies in other States and countries made available to thorough inquiry and research.

JUDICIAL FAIRNESS INVOKED.

It submits that the individual members of your Commission are bound by their oaths to deal with this subject with judicial fairness; that they should have equal regard to both sides of the controversy, acting with caution and from an intelligent consideration of all the facts and interests involved. It submits that such a thing as a candidate for a place on your honorable Board being pledged in advance of election to a reduction of freights and fares before he could have had information, knowledge, or experience to qualify him to speak to the question at all, was never contemplated by the framers of the Constitution, much less by the people whose votes adopted that instrument.

It asserts that the agitation of the question by a portion of the press is for political effect, to serve the personal ends of men scheming for place, and it finds its only support in an exaggerated public opinion, manufactured by persistent misstatement and gross misrepresentation—misrepresentation which your honorable body can, and in the judgment of the company, should correct, if not for the protection of the vast transportation interests committed to its charge by the Constitution, for the protection of the people from demagogism, than which nothing can be more demoralizing to enlightened citizenship, or dangerous to free institutions.

For example, see the following clipping from a morning paper:

A CASE IN POINT.

Concerning the question of railroad discrimination, a correspondent at Santa Ana, Los Angeles County, furnishes the Examiner an item of news to which we call the attention of the Railroad Commissioners:

To the Editor of the Examiner:

SIR: This town is distant from Los Angeles thirty-three and one third miles. The railroad company charges for a *carload of hay* from here to Los Angeles seven dollars; from Los Angeles to this place for a carload of hay twenty dollars. Can you explain the justice and reason for this *discrimination*? Can our Railroad Commissioners furnish a reasonable solution of the question?

SANTA ANA, July 2d.

The charge for a carload of hay between Santa Ana and Los Angeles is fifteen dollars in either direction. The only foundation for the misstatement is found in the fact that the difference between the rates from Los Angeles and Santa Ana respectively to Arizona points is seven dollars per carload.

Denial by the carrier of such misstatements will have little effect on public opinion. Inquiry and correction, according to the facts, by your Commission, would soon end malevolent charges of this character with a beneficent effect upon society.

The company does not presume to gauge the influence which public agitation has had in determining the proposed action of your honorable Board. It would, however, respectfully urge that the demand of a few, or all in a community, is not a sufficient ground for the Commission's action. It should first determine whether such demand is right. It has no moral or legal prerogative to experiment. Tentative movements of this character are opposed to public and private rights, a perversion of the powers which have been delegated to your honorable Board in the name of the people. Hasty, ill advised action, the behest of so called party managers, is inconsistent with the dignity of a Board whose origin is found in public ignorance of the transportation question and a professed unwillingness upon the part of public servants to act without due inquiry, lest injustice might result to the people or to the carrier.

The question arising here is whether the members of this Commission, taking office but six months ago, have so informed themselves upon the subjects as to say under their oaths of office that the rates of freight now charged and collected by this company are unreasonable or unjust.

The company protests that the charges for its services are fair and reasonable, judged by any proper standard; that an enlightened public policy does not justify interference with its tariffs; that the growth of the State, the advancement of its material interests, the present condition of its industries as compared with older communities nearer the great markets of the world, all testify against the malicious assertions of those who charge upon the company a grasping, grinding policy, necessitating governmental regulation and control.

THE AVERAGE CHARGE FOR FREIGHT.

The average charge for freight which was both taken up and laid down within the State of California during the year 1882, was at a rate of but two and nine tenths ($2\frac{9}{10}$) cents per ton per mile, notwith-

standing the legal maximum of fifteen cents per ton per mile. The average length of haul was only one hundred and five miles. This average rate includes all the short hauls, the mountain service on the Sierra Nevadas, the Tehachapi and Coast Range, and the service across the Mojave and Colorado Deserts. It excludes all material for company's use, which, if included at a rate equal to the estimated cost of service, as is the custom with most railroad companies in exhibits of this character, would materially reduce the average. This point should not be overlooked in comparison with exhibits of other railroads. It excludes all freight interchanged with other States and Territories on the Pacific Coast, and also all through freight interchanged with the States east of the Rocky Mountains.

The result of the policy pursued by a railroad company in its effect upon the communities it serves, or even upon its own revenues, can only be exhibited by yearly averages, and often a more extended period is necessary to a proper test. This, doubtless, is true in the case of the Central Pacific Railroad and dependencies to a greater degree than with other railroads in this country. No other system of roads in one State presents such varied physical characteristics as does the Central Pacific in California. Such a combination of valley, mountain, and desert road can nowhere else be found. This necessitates a complicated classification of service and charges with respect to the character of the road, which, together with the classification of freight with respect to its bulk, value, and influence upon the general prosperity of the community, as a whole, makes uniformity of charges impossible and the average rate the most approximate index to the correctness of the tariff.

The company, therefore, submits the fact that its average charge for the transportation of freights wholly within the State of California, during 1882, being but two and nine tenths ($2\frac{9}{10}$) cents per ton per mile—less than one fifth of the maximum allowed by law—is indubitable evidence that the charges are reasonable and should not in any particular be disturbed.

THE TENDENCY OF RATES DOWNWARD.

It submits, further, as evidence that the tendency of freights is downward, calling for no interference by the State, the statement that the average charge for freight service wholly within the State of California has been, during the past five (5) years, as follows:

During 1878, 3.7 cents per ton per mile.
During 1879, 3.6 cents per ton per mile.
During 1880, $3\frac{1}{2}$ cents per ton per mile.
During 1881, 3.1 cents per ton per mile.
During 1882, 2.9 cents per ton per mile.

The company further protests against the proposed action as unjustly discriminative. It is generally understood to be directed wholly against the Central Pacific Railroad and leased lines. Short independent lines, operated, as alleged by their managers, without profit, are to be exempted from the contemplated action of the Commission. It might be made to appear that such action was not designed to reward bad judgment and incapacity on the part of the projectors and managers of the non-paying railroads, but to punish sagacity and good management, to which, ordinarily, the success of

a paying enterprise is largely owing. California needs many more branch lines, yet, by such action the State, through its Railroad Commissioners, says to the would-be investors: "If you build these roads and the investment proves good, we shall arbitrarily reduce your charges, so as to equalize the income and outgo."

If the North Pacific Coast Railroad Company, the California Southern Railroad Company, and others, are to be favored by no interference upon the part of your honorable Commission, on the ground of the smallness and the unremunerative nature of their traffic, upon what considerations of justice can a different policy be pursued toward the several integral parts of the Central Pacific system, which could not be operated independently, and preserve the same facilities and service to the public, which, by themselves considered, do not yield a reasonable revenue? These parts of the Central Pacific system are distinct corporations, having distinct and separate obligations, and it is respectfully submitted that they are entitled to distinct and separate considerations, apart from their connection with the Central Pacific; that upon the grounds upon which it is proposed to exclude roads which are independent of the Central Pacific from the reductions contemplated by the Commission, those small roads leased to the Central Pacific are entitled to claim the right to charge such rates as will yield a fair profit upon the investment.

SPECIFIC OBJECTIONS TO REDUCTION.

For specific objections to the reductions proposed, the company respectfully urges against that for moving grain from interior points to tide-water:

First—There is no general or well founded complaint against the rates charged for this service.

Second—A reduction ranging from seven (7) per cent on the low rates, for the short hauls from bay points, to thirty-three and one third (33 $\frac{1}{3}$) per cent on the rates from the upper Sacramento Valley, and from twenty-seven (27) to thirty (30) per cent on the rates from the upper San Joaquin Valley, was made at the instance of your predecessors, taking effect on, and continuing in force since, the first day of June, 1881. A further reduction could not but be regarded by fair-minded men as unreasonable and unjust, savoring of a desire to cripple the railroad company, rather than to enforce equal and just tariffs.

Third—The grain rates, as modified in the manner above explained, are not burdensome to the producer. They rather contribute largely towards making the production of grain in California more profitable to him than it is in any of the great grain fields west of the Mississippi River, and east of the Rocky Mountains. In support of this, your Commission is respectfully referred to the exhibits filed with it on the twenty-seventh ultimo, one of which compares the grain rates of this company to Port Costa—now the principal grain depot for export—from all points, beginning with Martinez (distant three and four tenths miles), and running south to Santa Ana (distant four hundred and eighty-three miles), with rates for like distances charged by the Texas and Pacific Railway to New Orleans, the Missouri Pacific Railway to St. Louis, the Chicago, Milwaukee, and St. Paul Railway to Milwaukee, and the Chicago and Northwestern Railway to Chicago.

THE AVERAGE PER TON PER MILE.

The average per ton per mile of the rates charged, based upon equality of tonnage for all points, is as follows :

Central Pacific.....	1 ⁸⁶ / ₁₀₀ cents
Texas and Pacific.....	2 ¹⁰⁰ / ₁₀₀ cents
Missouri Pacific.....	2 ³⁷ / ₁₀₀ cents
St. Louis and San Francisco.....	2 ¹⁰⁰ / ₁₀₀ cents
Chicago, Milwaukee, and St. Paul.....	2 ¹⁰⁰ / ₁₀₀ cents
Chicago and Northwestern.....	1 ⁸⁰ / ₁₀₀ cents

The lowest average of the eastern roads named is that of the Chicago and Northwestern Railway, one of the leading railroads of the great Northwest, whose mileage is about equal to that of the Central Pacific system, and whose gross tonnage, per mile operated, during the year 1882, was two thousand five hundred and twenty tons (according to Poor's Manual), against one thousand and eighteen and one half tons, per mile operated, carried by the Central Pacific system; yet the average charge for grain by the Chicago and Northwestern Railway is one and eight tenths cents per ton per mile, against one and sixty-six one hundredths cents per ton per mile, the average of the Central Pacific.

Another compares the grain rates of the Central Pacific to Port Costa from all points, beginning at Goodyears (six and seventy-seven one hundredths miles distant), and running, via the California Pacific and northern roads, to Tehama, in the upper Sacramento Valley (distant one hundred and fifty-five miles), with rates charged for like distances to Milwaukee by the Chicago, Milwaukee, and St. Paul Railway, another of the great railroads of the Northwest. On bases of equality of tonnage from all points, the average charge in cents per ton per mile of the Central Pacific compares, with that of the Chicago, Milwaukee, and St. Paul as two and fifty-one one hundredths is to three and forty-two one hundredths, the eastern road charging an average of thirty-six per cent more than the Central Pacific.

Another exhibit shows the average grain rate of the Central Pacific to Port Costa, from stations between Goodyears and Willows, to compare with the average of the Chicago and Northwestern Railway for like distances in Illinois, to Chicago, as two and seventy-three one hundredths cents is to three and three one hundredths cents per ton per mile, the eastern charge being higher by nine and eighty-nine one hundredths per cent than that of the California road.

THE STANDARDS OF EASTERN ROADS.

The other exhibits filed at the same time, and which compare rates from the Sacramento Valley, speak for themselves. They make a no less favorable showing for the Central Pacific; and, if charges by eastern roads are just standards by which to regulate the charge in California, they show conclusively that further involuntary reductions in the grain rates of this company would outrage justice.

This company, however, does not admit, nor will your honorable Board be likely to regard the rates charged by eastern railroads as fair criterions by which to judge the charges of the Central Pacific. The managers of the eastern roads themselves acknowledge the

greater cost of service here, and in through business, in which they are joined with the Central Pacific, allow the latter a greater rate per mile than their own companies receive. The cost of labor, fuel, and all supplies which are used in operating a road, is greater here than in the East. The physical characteristics of the road are more varied and difficult; the traffic is very much lighter; every element of cost or economy is against the California, and in favor of the eastern road.

It requires no expert knowledge to discover this. It ought not to require a protest from this company to secure proper consideration of the fact by the public and your honorable Board. In the matter of handling grain, the Central Pacific's service is greater and more expensive than that of eastern roads. The rates of the Central Pacific include unloading at tide-water and delivery at ship's side, if vessel is ready for grain; or, if not ready, delivery at pile on wharf, or in warehouse. The grain is handled in sacks, is housed at forwarding stations only to a limited degree, being largely "corraled," or piled, without shelter, alongside the track. This requires it to be moved before the early rains, demanding of the railroad company such attention and expedition as to not infrequently compel neglect of other traffic; while, as a rule, the cars are sent empty after the load, thus doubling the car mileage for one load.

GRAIN SHIPMENTS IN THE EAST.

By eastern roads the grain is uniformly handled in bulk. It is universally housed after harvest, and is moved only as the market is favorable, or the necessities of the farmer require. In loading it usually passes through an elevator, being shot into the cars at such a rate that a full train can be loaded and moved while one car is being loaded in California. At the various termini it is discharged into elevators, a car being emptied in something less than one minute. The economy permissible in the use of rolling stock by this rapid loading and discharging of cars is very marked. Cars have made two round trips in one day between Aurora and Chicago, Illinois, a distance of about fifty miles, a thing impossible here under four days. According to this, the California road would be required to at least quadruple the rolling stock employed by the Illinois road to handle the same tonnage a like distance. Moreover, the return traffic on eastern roads, in coal, lumber, etc., used in the interior, nearly balances the outward tonnage of cereals and produce, giving full loads in both directions. Within a few weeks the writer was informed by Mr. Midgley, the Commissioner of the Iowa Trunk Line Association, that, latterly, the east and west tonnage of the lines he represented nearly balanced, and he looked for equality within a short time.

From the foregoing the company argues that any reduction in grain rates is indefensible. It is aimed at that portion of the traffic which, in acknowledgment of the principle that by fostering production it promotes its own interests, it has, with the prescience of trained judgment, treated with unexampled liberality.

CLASSIFICATION OF TRAFFIC.

With respect to the proposed reduction on grain for seeding and feeding purposes going to the interior to the level of rates for outward

grain, the company would, in addition to the general protest against any reductions whatever, urge that the principle which the Commission would set up in this case, namely: that rates for the same class of goods should be the same for like distances, regardless of direction, is erroneous. Classification of traffic for the purpose of rating charges thereon is necessary and universal. It has not become universal by the election of the carriers; the laws of trade have forced it. If possible, an average rate upon all goods would be adopted by every carrier: its effect in simplifying and economizing the conduct of transportation can hardly be measured. This classification must be had, not only with respect to different values, bulk, weight, fragility, etc., but also to volume, direction, and competition. For example, manufactured cottons from the mills of the South to the North, are rated materially lower than from the mills of New England to the South, the difference ranging from forty-five to forty-seven per cent; this in spite of the fact that the raw material must first go from the South to New England in order to be milled and returned. Raisins, before becoming an important California product were, and even now are, brought from the East for from two to three cents per pound. They are sent from California to the East at one and one half cents per pound. Examples might be multiplied. Fifty cents per ton upon the product of his ranch amounts to considerable to the California farmer, very much more than five times that rate would equal on the small amount of seed wheat he should want from another section.

MINIMUM AND MAXIMUM RATES.

The design of classification is to place the higher charges where they will not be felt, at least not be burdensome to the consumer. All freight cannot be handled at the minimum rate—some must pay the maximum. If the maximum is reduced, or considerable tonnage taken from the intermediate classes and rated with the lowest, then the minimum must be increased. So much for the principle.

It must be admitted that wheat is wheat, whether going in or out of the country, but its value is not the same, and the difference in volume is very wide.

The company must earnestly protest against the introduction of any such principle of rating as this proposition of the Commissioners involves. It is destructive of the fundamental principles of tariffs.

The present rate on grain to the interior works no hardship to the public. The proposed action of the Commission will have no appreciable influence upon the State's prosperity. It is a concession to ignorance. It is suggested by comparison. The complaint stands not that the maximum charge of \$8 05 per ton of 2,000 pounds for carrying grain to the interior is too high *per se*, but because the maximum charge in the other direction is but \$5 50. Adopt the principle and apply it wherever it has equal force, and you will destroy classification. Destroy classification, and you will ruin either the community served by the carriers or the carriers themselves.

The rates on live stock in carloads, and on wool, in both carloads and smaller quantities, should not be disturbed, for the reason that, at the instance of your predecessors in office, general and material reductions were made in the rates on these articles, which reduced rates, taking effect June 1, 1881, have since continued and are now in force.

By reference to a table published by the Railroad Commission, May 11, 1881, it will be observed that these reductions ranged from two per cent to over fifty per cent, as a rule, the larger reductions being made in the highest rates for the longer hauls.

TRANSPORTATION OF LIVE STOCK.

The rule for charging for the transportation of live stock, in less than carloads, is to rate one animal as one ton; two animals as one and three quarter tons; three animals as two and one half tons, and each additional animal as one half ton of first class freight, and so on until the charge for the lot equals the charge for a carload, that being the maximum for any number of animals in one car.

This system of rating favors the live stock as compared with ordinary freight. One animal occupies more space than one ton of freight. Indeed, it requires nearly half a car. Economy or convenience cannot be respected in stowing the animals. Regard must be had to their temper and condition. If laid out by any accident on the road they must be fed and watered. Jars, jolts, and accidents, harmless to ordinary freight, are dangerous to them. They are liable to injure themselves and each other, and to damage goods, if any be loaded in same car. The company seeks to absolve itself from responsibility for injuries from some of these causes by requiring the shipper to provide an attendant; but this, in the case of less than carloads, is evaded, and the company has yet found no means to enforce its rule in this regard.

Though transportation is its business, and its capacity is not half taxed, the company would gladly surrender its revenues derived from transporting live stock, in less than carload quantities, to be relieved from the obligation—if it is under any—of handling it.

The carrier performs no service relatively so cheap.

GENERAL PROTEST REPEATED.

With respect to the other changes proposed, the company respectfully repeats its general protest. The question cannot have had that calm deliberation proceeding from careful analysis and diligent research necessary to determine judgment. What evidence has been offered that the charges of the Central Pacific Railroad Company are onerous and exacting?

What inquiry has been made as to whether arbitrary reductions of its revenues will not cripple the company, cause it to default in its interest, compel discontinuance of dividends, and make the discharge of its obligations to the General Government impossible? Can reflecting men believe, for a moment, that the State, through the exercise of arbitrary power, can injure the very backbone of its commercial life and the commonwealth remain unscathed?

Common prudence dictates deliberation and investigation before action upon the part of your Commission. The very means being employed to force hasty and ill-advised action upon the part of the Commission should induce reflection and hesitation. A high minded, honorable man, cool and dispassionate though he may be, may well distrust his judgment under such a pressure as some are endeavoring to bring to bear on your honorable Board.

The Central Pacific Company does not fear the tests which a careful inquiry and just comparisons will make of its policy with respect to freights, but it solemnly protests against reductions inspired by political influences, and all interference with its tariffs which does not proceed from due consideration of the private as well as the public interests involved.

Very respectfully,

A. N. TOWNE,
General Manager.

By J. C. STUBBS, Freight Traffic Manager Central Pacific Railroad Company.

APPENDIX D.

The Pacific Coast Steamship Company vs. The Board of Railroad Commissioners.

In the Circuit Court of the United States, Ninth Circuit, District of California.

Before Field, Circuit Justice, and Sawyer, Circuit Judge.

The plaintiff is a corporation formed under the laws of California, for the transaction of the business of a steamship company on the Pacific Coast, and in its bays and harbors, and on the Pacific Ocean. It is the owner of a large number of steamships engaged in the coasting trade, making voyages along the Pacific Coast from San Francisco in California, to Astoria and Portland, in Oregon; to ports on Puget Sound, in Washington Territory, and to ports in British Columbia, and from San Francisco to San Diego, in California, touching at intermediate ports on the coast.

All the steamships in making their voyages navigate the Pacific Ocean more than a marine league from the shore. They carry goods sent from Europe, Asia, and States east of the Rocky Mountains, upon through bills of lading via San Francisco. Some of the goods are transferred to the vessels in the original unbroken packages, and some after the packages have been opened. Passengers, with and without through tickets from other States and from Europe, are carried on the steamships north and south from San Francisco. Passengers and freight are also carried in these vessels from ports in California to other ports in the State. All the vessels are enrolled and licensed to carry on the coasting trade under the Acts of Congress.

By the Constitution of California, adopted in 1879, all railroad, canal, and other transportation companies, are declared to be common carriers and subject to legislative control. Provision is also made for the election of three persons called Railroad Commissioners, who are invested with the power, and it is made their duty, to establish rates of charges for transportation of passengers and freight by such companies, and publish the same from time to time; to examine their books, records, and papers; to hear and determine complaints against them; to punish for contempt of the orders and processes of the Commissioners, and enforce their decisions; and to provide a uniform system of accounts to be kept by the companies.

The complaint in this case is that the defendants, the Commissioners, elected under these provisions of the Constitution, intend and threaten to establish rates of charges for passengers and freights on the steamships of the plaintiff engaged in the coasting trade as mentioned, and exercise with respect to them all the other powers there conferred; and the plaintiff prays that they may be restrained in that respect. This suit was commenced when the late Commissioners were in office, but as it is against the Board as an official body, and not the members personally, it has been resubmitted for decision within the past month.

The defendants admit that it is their purpose to carry into execution the powers with which they are invested, and to establish rates of charges for passengers and freight upon the steamships, so far as relates to transportation between ports within the State, but disclaim all intention to regulate or interfere with the transportation of persons or freight from ports within the State to ports without it, or from ports without it to ports within it.

The question is, can they regulate or interfere with transportation of persons or merchandise between ports within the State, if they be in transit to or from other States, or the transportation involves a voyage upon the ocean. The question in one of its aspects is new, but in neither aspect is it difficult to solve. The Constitution vests in Congress the power to regulate commerce with foreign nations and among the several States. The power to regulate is the power to govern; to prescribe the rules by which commerce shall be conducted, to declare when it shall be burdened with conditions, and when it shall be free and untrammelled.

Commerce, as has often been said, is a term of large import. It includes the carriage of persons, and the transportation, purchase, sale, and exchange of commodities between citizens or subjects of other countries and our own people, and between the people of different States. It embraces navigation, and extends to all the instruments used in navigating inland waters and the ocean.

It was at one time a subject of much discussion and some disagreement among Judges whether the power conferred upon Congress to regulate commerce is exclusive in its character or concurrent with that of the States. By recent decisions this question has been put at rest. When the subject upon which Congress can act under this power is national in its character, and admits and requires uniformity of regulation, affecting alike all the States, then the power is in its nature exclusive; but when the subject upon which the power is to act is local in its operation, then the power of the State is so far concurrent that its action is permissible until Congress interferes and takes control of the subject. Of the former class, is all that portion of commerce with foreign countries and among the States, which consists in the carriage of persons and the transportation, purchase, sale, and exchange of commodities. From necessity there can be but one rule in such cases for all the States; and the only power competent to prescribe a uniform rule is one which can act for the whole country. Its non-action in such cases is, therefore, equivalent to a declaration that such commerce shall be free from State interference. "There would otherwise be," as said in *County of Mobile vs. Kimball*, "no security against conflicting regulations of different States, each discriminating in favor of its own products and citizens and against the products and citizens of other States. But it is a matter of public history that the object of vesting in Congress the power to regulate commerce with foreign nations and among the States, was to insure uniformity of regulation against conflicting and discriminating State legislation." (102 U. S. 697; see, also, *Cooley vs. The Board of Wardens of the Port of Philadelphia*, 12 How. 299; *Gilman vs. Philadelphia*, 3 Wall. 713; *Wellton vs. State of Missouri*, 91 U. S. 275.)

Of the second class, are all those subjects which can be best regulated by local authority, such as harbor pilotage, and the placing of buoys and beacons to guide ships to the proper channel in entering bays and harbors. Action by the States upon such subjects is not

deemed any encroachment upon the power of the General Government; but when Congress acts with respect to them the authority of the State is superseded.

It follows from these views that with respect to all inter-State or foreign commerce the Railroad Commissioners have no authority to interfere. Congress has prescribed all the regulations which are permissible so far as that commerce is carried on in vessels. These regulations, it is true, are principally designed to insure safety in the navigation of the vessels and the protection and health of their officers and crews. Congress has not attempted to prescribe what charges may be made for the carriage of persons and merchandise in vessels—considering, perhaps, that they were more likely to be regulated upon just and equitable principles by competition than by legislation. Whatever the reason Congress has not seen fit to act upon that subject.

With respect to purely domestic commerce carried on by these vessels the Commissioners possess all the authority which the State can confer. But when can the vessels in carrying persons and merchandise between different ports in the State be held to be engaged in commerce purely domestic—for there is a commerce within the State which does not come within that designation? We answer that they are not so engaged when they take up persons or merchandise to carry to a destination within the State from a place without it, or they take up persons or merchandise in the State to carry to a place without its limits. This is the purport of the decision of the Supreme Court in the case of the steamer "Daniel Ball" (10 Wallace, 557). That vessel was engaged in shipping and transporting down Grand River, in Michigan, goods destined and marked for other States than Michigan, and in receiving and transporting up the river goods brought within the State from without its limits. But as her agency in the transportation was entirely within the limits of the State, and she did not run in connection with or in continuation of any line of vessels or railway leading to other States, it was contended that she was engaged entirely in domestic commerce. But the Court answered that the conclusion did not follow, and said that "so far as she was employed in transporting goods destined for other States, or goods brought from without the limits of Michigan and destined to places within that State, she was engaged in commerce between the States, and, however limited that commerce may have been, she was, so far as it went, subject to the legislation of Congress. She was employed as an instrument of that commerce; for whenever a commodity has begun to move as an article of trade from one State to another, commerce in that commodity between the States has commenced. The fact that several different and independent agencies are employed in transporting the commodity, some acting entirely in one State and some acting through two or more States, does in no respect affect the character of the transaction. To the extent in which each agency acts in that transportation, it is subject to the regulation of Congress." (10 Wallace, 565.)

Nor are the vessels engaged in purely domestic commerce when their voyages between ports of the same State require them to navigate the ocean. When they go beyond the marine league they pass out of the jurisdiction of the State, and come under the exclusive control of Congress. To bring the transportation within the control of the State as part of its domestic commerce, the subject transported

must be within the entire voyage under the exclusive jurisdiction of the State. (Lord vs. Steamship Company, 102 U. S. 541.)

If the steamships of the plaintiff carried any persons or merchandise between ports of the State, not going out, on their voyage between those ports, of the jurisdiction of the State, and the persons or merchandise carried not coming from any other State or foreign country, or going to another State or country, the transportation commencing and ending in the State, then to that extent they would be engaged in commerce purely domestic, and to that extent the Railroad Commissioners might have jurisdiction to regulate the fares and freights for transportation on the vessels. But it is conceded by the pleadings that in every voyage made by the vessels to ports from San Francisco, they pass out upon the ocean beyond a marine league from the shore. They are, therefore, engaged in no transportation which the Commissioners can regulate.

We have had some doubt as to our jurisdiction in this case, but as the Commissioners have raised no objection on that ground, and seem anxious to have an adjudication as to the extent of their authority, we have not deemed it expedient to refuse a consideration of the questions submitted. Besides, without some adjudication upon them, the plaintiff would be placed in great embarrassment. If the Commissioners have the authority claimed, the company would be liable to a fine of twenty thousand dollars for every instance of disregard of their regulations, and each of its officers would be liable to be punished by fine and imprisonment.

Let a decree be entered for the plaintiff as prayed in the bill.

APPENDIX E.

STATEMENT FROM DAVID NYE, SUPERINTENDENT OF THE NORTH
PACIFIC COAST RAILROAD COMPANY, IN ANSWER TO RESOLUTION
No. 15.

[Filed December 21, 1883.]

NORTH PACIFIC COAST RAILROAD COMPANY, }
 GENERAL OFFICE, 408 CALIFORNIA STREET, }
 SAN FRANCISCO, December 14, 1883. }

To the honorable Board of Railroad Commissioners:

GENTLEMEN: Replying to your valued favor of the sixteenth ultimo, I beg to submit to your honorable Board the following facts, namely:

The total earnings of our road in 1882 were	\$358,199 67
The total operating expenses in 1882 were	290,781 69
Leaving \$67,417 98 to pay interest on bonded and other debts, amounting to...	63,967 03
Leaving a net profit of	3,450 95

In \$2,816,304 53, the cost of the property, which I think shows sufficient cause why reductions should not be made in the rates charged by this company, at the same time stating that I do not know of any of our patrons complaining of the present rates.

Yours respectfully,

DAVID NYE,
General Superintendent.

SWORN STATEMENT FROM A. M. STEVENSON, PRESIDENT VACA VALLEY
AND CLEAR LAKE RAILROAD COMPANY, IN ANSWER TO
RESOLUTION No. 15.

[Filed December 21, 1883.]

OFFICE OF THE VACA VALLEY AND CLEAR LAKE RAILROAD }
 COMPANY, VACAVILLE, December 10, 1883. }

To the honorable Board of Railroad Commissioners of the State of California:

GENTLEMEN: The undersigned, A. M. Stevenson, President of the Vaca Valley and Clear Lake Railroad Company, hereby appears on behalf of said company, and submits for your consideration the following reasons why this road should not be subjected to the same passenger rates as the Central Pacific Railroad Company and its leased lines.

First—That the passenger rates are not considered exorbitant by

those who have enjoyed the advantages of the road from its construction.

Second—That the passenger rates were established by the citizens along said road, who met in convention and agreed on the present tariff for passengers.

Third—That the passenger train is run to accommodate the people along the line of road, who get on and off at other than regular stations.

Fourth—That the country through which the road passes is sparsely inhabited, "being held in large grants," consequently the travel is light.

Fifth—That our near proximity to the California Pacific Railroad at Woodland, Davisville, Dixon, Elmira, and Suisun, prevents any excessive charges by us.

Sixth—That the present rates of passenger fare on said railroad are reasonable, producing a moderate profit for the cost and expenses incurred in the performance of the transportation of said passengers.

A. M. STEVENSON,
President V. V. and C. L. R. R. Co.

Subscribed and sworn to before me, on the twenty-first day of December, 1883, at the City and County of San Francisco, State of California, by A. M. Stevenson, President Vaca Valley and Clear Lake Railroad Company, as a full and true statement, to the best of his ability, knowledge, and belief.

W. W. FOOTE,
Railroad Commissioner Third District.

SUPPLEMENTAL STATEMENT, VACA VALLEY AND CLEAR LAKE RAILROAD COMPANY.

Passenger earnings from January 1 to October 31, 1883		\$7,715 99
Total passenger expense, January 1 to October 31:		
To labor	\$2,098 46	
Stationery and printing	159 26	
Repairs, passenger cars	187 85	
Oil and waste	283 78	
Wood	2,150 77	
Miscellaneous expense	500 00	
		5,380 12
Total passenger earnings	\$7,715 99	
Total passenger expense	5,380 12	
		2,335 87
Total passenger earnings	\$7,715 99	
Less twenty-eight and one half per cent proposed reduction	2,199 05	
		5,516 94
Earnings	\$5,516 94	
Expense	5,380 12	
		136 82
Earnings for ten months		\$7,715 99
Average number passengers per month		920
Average number of passengers per day		35
Average earnings for one day		\$29 67
Average amount paid by each passenger		84 cents
Amount paid by each passenger per mile for one day's run of passenger train, (120 miles per day)		7 mills

SWORN STATEMENT FROM J. N. VICTOR, SUPERINTENDENT OF THE
CALIFORNIA SOUTHERN RAILROAD COMPANY, IN ANSWER TO
RESOLUTION No. 15.

[Filed December 21, 1883.]

CALIFORNIA SOUTHERN RAILROAD COMPANY, }
SUPERINTENDENT'S OFFICE, }
NATIONAL CITY, CAL., December 17, 1883. }

W. R. Andrus, Esq., Secretary Board of Railroad Commissioners, San Francisco, California:

DEAR SIR: In response to Order No. 15, dated November fifteenth, to appear before the honorable Board of Railroad Commissioners and show cause why reductions should not be made on the California Southern Railroad corresponding with those made on the Central and Southern Pacific Railroads and leased lines, I herewith beg to submit the following:

The California Southern Railroad is but an unfinished link in a contemplated new and independent through line.

The road has no land grant, neither has it received Government or State aid of any kind. It runs through a rough, broken country, very sparsely settled. It was an extremely expensive road to build, and is a very hard and expensive one to operate.

The three millions of dollars invested in building from San Diego Bay to Colton was foreign capital, and every dollar of it.

With the greatest economy in operating, it has, up to this date, been impossible to pay running expenses, much less any interest on the large investment.

Since the line was opened to San Bernardino, it has been a constant struggle for existence with us.

Our rates are low, very low, when compared with other unfinished new roads built through similar country. And the people interested, almost without exception, are satisfied that, under the circumstances, the management are doing all that could consistently be asked.

Our opponents are doing everything in their power to reduce the revenue of the road and to discourage eastern friends from putting more money in this project.

Nothing could so well serve their purpose as this very action by your honorable Board at this critical time. I am well satisfied the people of Southern California earnestly desire the extension of the California Southern Railroad.

They are watching with the greatest personal interest every move made. Not a man but would regret any action tending directly or indirectly to discourage or retard this project.

Herewith please find statement giving details of earnings and expenses of the road for ten months, ending October thirty-first, which shows an actual deficit (exclusive of interest) of \$9,103 86, which, with interest added, would give a deficit of \$164,153 86.

All of which is respectfully submitted, and would seem to show most conclusive reasons why reductions should not be made on the California Southern Railroad.

Very respectfully,

J. N. VICTOR,
Superintendent.

Subscribed and sworn to on the twenty-first day of December, A. D. 1883, in the City and County of San Francisco, State of California, by J. N. Victor, Superintendent of the California Southern Railroad Company, as a full, true, and correct statement, to the best of his information and belief.

W. W. FOOTE,
Railroad Commissioner, Third District.

SWORN STATEMENT FROM JOHN F. KIDDER, SUPERINTENDENT OF
THE NEVADA COUNTY NARROW GAUGE RAILROAD COMPANY, IN
ANSWER TO RESOLUTION NO. 15.

[Filed December 21, 1883.]

*To the honorable the Board of Railroad Commissioners of the State
of California:*

GENTLEMEN: Answering the resolution of your honorable Board, to appear and show cause why reductions should not be made on the Nevada County Narrow Gauge Railroad, corresponding to those made on the Central Pacific and Southern Pacific Railroads, and leased lines, I would most respectfully submit the following reasons to your honorable body:

The Nevada County Narrow Gauge Railroad Company was incorporated in 1874, under a special Act of the Legislature of California (a copy of which is herewith submitted), authorizing said corporation to charge certain rates, named therein, for passenger and freight traffic. Without said guarantee of the State of California, no one would have been found willing to invest their money in the enterprise, as the ordinary rates, under the general railroad law, could by no possibility have been made to pay.

The subscribers to the stock of the company were local men, interested on the line of the road, who paid in full for their stock at face value, and who have received but three dividends of three per cent each on a sum total of twenty-one thousand seven hundred and ninety-eight (\$21,798*) dollars on their investment of two hundred and forty-two thousand two hundred (\$242,200) dollars for over seven years, which certainly cannot be regarded as an extraordinary inducement for capitalists to invest in local roads. The company has a bonded debt of two hundred and sixty thousand (\$260,000) dollars, bearing an annual interest of eight per cent, and has, heretofore, been able promptly to pay said interest, together with the taxes, but will be obliged to borrow a small sum to meet the interest and taxes due January 1, 1884.

The road is a mountain line, with gradients of from ninety to one hundred and twenty-one feet per mile, with not a full mile of level in the whole twenty-three miles. There are one hundred and ninety-three (193) separate curves, making a total curvature of 7,600°, or more than twenty-one (21) full circles, curves varying in radius from three hundred and one to five hundred and seventy-three feet. There

* Forty-five per cent paid in 1874; interest paid September, 1881; interest paid March, 1882; interest paid September, 1882.

are twenty-five hundred (2,500) lineal feet of trestling from thirty-five (35) to ninety-five (95) feet in height. Two truss bridges of one hundred and sixty feet clear span each, of a distance from surface of water to top of rail of eighty-seven and ninety-five feet respectively. Two tunnels lined and supported with timber, the aggregate length being eight hundred feet. We were compelled last year to renew one truss bridge at a cost of \$9,500, and during the present year have expended over \$15,000 in rebuilding one truss bridge and the trestle approaches to the same, and over \$600 in replacing sound timbers for decayed ones in the tunnels. It will thus be evident that we have a most expensive road to operate.

We are dependent entirely upon a mining county to sustain us, and our business could not be increased by lowering rates. One branch of mining industry, viz.: hydraulic, has been almost paralyzed for the last two years by adverse litigation.

Should the rates of traffic on our road be reduced, it would be impossible to operate, and I sincerely trust that your honorable body will not for a moment entertain a proposition of that kind which is unasked for by the patrons of the road.

Respectfully submitted.

JOHN F. KIDDER,
General Superintendent and Chief Engineer.

DECEMBER 21, 1883.

Subscribed and sworn to before me on the twenty-first day of December, A. D. 1883, at the City and County of San Francisco, State of California, by John F. Kidder, General Superintendent and Chief Engineer of Nevada County Narrow Gauge Railroad, as a full and true statement to the best of his ability, knowledge, and belief.

G. J. CARPENTER,
Railroad Commissioner, First District.

APPENDIX F.

EXTRACTS FROM THE ANNUAL REPORTS OF THE CENTRAL PACIFIC RAILROAD, ITS LEASED LINES, AND OTHER RAILROAD COMPANIES, TO THE BOARD OF RAILROAD COMMISSIONERS OF THE STATE OF CALIFORNIA, FOR THE YEAR ENDING DECEMBER 31, 1882.

[Broad Gauge.]

CENTRAL PACIFIC RAILROAD AND LEASED LINES.

Total earnings passenger department	\$8,777,344 50
Total earnings freight department	\$16,310,047 95
Total miscellaneous earnings, telegraph, warehouse, etc.	\$1,588,109 96
Total income from all sources	\$26,675,502 41
Total expenses	\$17,101,766 92
Total net income	\$9,573,735 49
From which deduct interest on funded and other debts credited to sinking fund and United States, and dividends	\$9,538,723 56
Remainder	\$35,011 93
Net income, 1881	\$10,809,828 93
Net income, 1882	\$9,573,735 49
Net income, 1882, less by	\$1,236,093 44
Total income, 1881	\$25,389,257 35
Total income, 1882	\$26,675,502 41
Difference	\$1,286,245 06
Earnings per mile of road operated, 1881	\$8,899 28
Earnings per mile of road operated, 1882	\$8,436 95
Earnings per mile of road operated, 1882, less than in 1881	\$462 33
Earnings per train mile (total passengers and freight), 1881	\$2 83
Earnings per train mile (total passengers and freight), 1882	\$2 54
Earnings per mile, passengers, 1882	\$1 38
Earnings per mile, freight, 1882	\$1 13
Number of passengers carried	7,688,514
Number of passengers carried east and west	95,226
Number of passengers carried one mile	255,824,363
Number of tons carried	3,109,697
Number of tons carried from other States	390,594
Number of tons carried in this State	2,719,103
Number of tons carried, produced in this State	1,716,566
Total number of tons carried one mile	902,981,309
Freight mileage to and from other roads	370,504,384
Average rate of freight per ton per mile for all	1 ⁸⁵ / ₁₀₀ cents
Average rate of freight per ton per mile, operated by this company	2 ³² / ₁₀₀ cents
Average rate of fare per mile for all passengers	2 ¹⁰⁰ / ₁₀₀ cents
Percentage of expense to total transportation earnings	62 ⁶⁰ / ₁₀₀ per cent

[Broad Gauge.]

SOUTHERN PACIFIC RAILROAD COMPANY.

Total earnings passenger department	\$557,520 25
Total earnings freight department	\$672,295 16
Total transportation earnings	\$1,229,815 41
From rents, use of road and equipments leased	\$1,666,666 00
From other sources	\$27,583 94
Total income from all sources	\$2,924,065 35
Total expenses	\$1,111,261 20

FOURTH ANNUAL REPORT OF THE

Net income.....	\$1,812,804 15
Interest on funded and other debts.....	\$1,712,434 69
Surplus paid to Sinking Fund.....	\$100,369 46
No dividends.	
Earnings per mile of road operated (176 miles).....	\$6,987 19
Earnings per train mile (total passengers and freight).....	\$2 62
Number of passengers carried.....	535,095
Number of passengers carried one mile.....	19,357,351
Number of tons carried, not including gravel.....	301,859
Average rate of fare per mile for all passengers.....	2 ⁸ / ₁₀₀ cents
Average rate of freight per ton per mile.....	3 ¹⁶ / ₁₀₀ cents
Length of road operated.....	176 ¹ / ₁₀ miles

[Narrow Gauge.]

SOUTH PACIFIC COAST RAILROAD COMPANY.

San Francisco to Santa Cruz.....	80 ⁸ / ₁₀ miles
Gross earnings passenger department.....	\$295,047 13
Gross earnings freight department.....	\$334,168 55
Total gross earnings.....	\$629,215 68
Income from all other sources.....	\$34,085 82
Total income.....	\$663,301 50
Total expenditures.....	\$542,882 40
Net income.....	\$120,419 10
Total train miles.....	426,695
Total number of passengers carried.....	982,437
Total number of passengers carried one mile.....	13,795,373
Total number of tons freight, in this State, carried.....	192,112
Total number of tons of freight carried one mile.....	6,511,150
Average rate of fare per mile for all passengers.....	2 ⁸ / ₁₀₀ cents
Average rate of freight per ton per mile on roads operated by this company.....	8 cents
Average rate of fare, not including ferry.....	3 ³¹ / ₁₀₀ cents
Highest rate of fare per mile.....	7 ²⁰ / ₁₀₀ cents

No percentage of expense to total transportation earnings given.

[Narrow Gauge.]

NEVADA COUNTY RAILROAD COMPANY.

Colfax to Nevada City.....	22 ³⁴ / ₁₀₀ miles
Total earnings, passenger department.....	\$38,842 92
Total earnings, freight department.....	\$66,430 28
Total transportation earnings.....	\$105,273 20
Earnings, per mile.....	\$4,649 87
Total income from all sources.....	\$105,291 92
Total expenses.....	\$89,182 54
Total net income.....	\$16,109 38
Percentage, expenses.....	84 ⁸² / ₁₀₀ per cent
Net earnings, passenger train, per mile.....	17 cents
Net earnings, freight train, per mile.....	40 cents
Total number of passengers carried.....	44,165
Total number of passengers carried one mile.....	425,962
Total number tons of freight.....	28,449
Average rate of fare for all passengers.....	8 ⁷¹ / ₁₀₀ cents
Average rate of freight per ton per mile for all.....	16 ³⁹ / ₁₀₀ cents

[Narrow Gauge.]

NORTH PACIFIC COAST RAILROAD COMPANY.

San Francisco to Duncans Mills.....	74 ²⁵ / ₁₀₀ miles
Total earnings, passenger department.....	\$194,204 02
Total earnings, freight department.....	\$155,158 85

Total transportation earnings.....	\$349,362 87
Total income from all sources.....	\$358,199 67
Total expenses.....	\$290,781 69
Net income.....	\$67,417 98
Percentage of same to capital stock and net debt.....	1 $\frac{35}{100}$ per cent
Net earnings per passenger train per mile.....	13 cents
Net earnings per freight train per mile.....	43 $\frac{1}{2}$ cents
Earnings per mile of road operated.....	\$3,574 04
Total train miles run.....	227,235
Total number passengers carried.....	687,896
Total tons of freight (not including gravel).....	70,721 $\frac{253}{100}$
Total freight or tons carried one mile.....	3,449,337
Average rate of local freight per ton per mile.....	4 $\frac{1}{2}$ cents
Percentage of expenses to transportation earnings.....	83 $\frac{1}{2}$ per cent

[Broad Gauge.]

CALIFORNIA SOUTHERN RAILROAD COMPANY.

National City to Colton.....	126 $\frac{88}{100}$ miles
Total earnings, passenger department.....	\$27,216 21
Total earnings, freight department.....	\$23,961 68
Total transportation earnings.....	\$51,177 89
Earnings per mile of road operated.....	Not reported
Total income from all sources.....	\$51,681 28
Total expenses.....	\$39,588 02
Total net income.....	\$12,093 26
Percentage of expense to total transportation earnings.....	77 per cent
Total number of passengers carried.....	9,087
Total number of tons carried one mile.....	541,474
Average rate of fare per mile for all passengers.....	4 $\frac{1}{2}$ cents
No average rate per ton is given.	
The highest rate per ton per mile for freight.....	15 cents
The lowest rate per ton per mile for freight.....	1 cent

[Broad Gauge.]

VACA VALLEY AND CLEAR LAKE RAILROAD COMPANY.

Elmira to Madison.....	29 miles
Total earnings, passenger department.....	\$11,482 21
Total earnings, freight department.....	\$80,215 91
Total transportation earnings.....	\$91,698 12
Earnings per mile.....	\$3,162 00
Total income from all sources.....	\$91,698 12
Total expenses.....	\$54,433 46
Net income.....	\$37,264 66
No dividends.	
Number of passengers carried, about.....	15,000
Number of tons of freight.....	50,378
Average rate all passengers per mile.....	8 cents
Average rate freight per ton per mile.....	7 cents
Percentage of expense.....	59 $\frac{4}{10}$ per cent

[Broad Gauge.]

SAN FRANCISCO AND NORTH PACIFIC RAILROAD COMPANY.

San Francisco to Cloverdale.....	90 miles
Branch from Fulton to Guerneville.....	16 miles
Total earnings passenger department.....	\$237,066 61
Total earnings freight.....	\$233,910 04
Transportation earnings.....	\$470,976 65
Earnings per mile of road operated.....	\$5,091 64

Total income from all sources.....	\$505,771 83
Total expense operating the road.....	\$282,784 46
Net income.....	\$222,987 37
Percentage of expense to total transportation earnings.....	55 $\frac{31}{100}$ per cent
Total number of passengers carried.....	151,840
Total passengers carried one mile.....	7,074,171
Number of tons carried (no gravel).....	85,054
Total number tons carried one mile.....	3,682,308
Average rate fare for all passengers.....	3 $\frac{10}{100}$ cents
Average rate of freight per ton per mile for all.....	6 $\frac{3}{100}$ cents

[Broad Gauge.]

CALIFORNIA NORTHERN RAILROAD COMPANY.

Marysville to Oroville.....	26 $\frac{1}{2}$ miles
Total earnings, passenger department.....	\$20,494 19
Total earnings, freight department.....	\$20,688 00
Transportation earnings.....	\$41,182 19
Total expense.....	\$25,564 08
Net income.....	\$15,618 11
Earnings per mile of road operated.....	\$1,554 04
Earnings per train mile (passenger and freight).....	\$2 12 $\frac{3}{100}$
Percentage of expense to transportation earnings.....	62 $\frac{3}{100}$ per cent
Average rate of fare per mile.....	Not given
Average rate of freight per ton per mile.....	Not given

The Black Diamond Coal Mining Company's Railroad, the Pittsburg Coal Mine Company's Railroad, the Salmon Creek Railroad Company, the Mendocino Railroad Company, and the Pacific Coast Railroad Company, have furnished this office with no report for 1882.

BOARD OF RAILROAD COMMISSIONERS OF THE STATE OF CALIFORNIA.

It is hereby certified that at a meeting of said Board held on the seventh day of January, 1884, at its office in San Francisco, to consider and adopt its annual report for the year 1883 to the Governor of said State, on motion the foregoing report, signed by Commissioners Carpenter and Humphreys, together with the appendices therewith, was duly approved and adopted as the report of said Commission for the year 1883, Commissioners Humphreys and Carpenter voting for, and Commissioner Foote against, the motion.

Thereupon it was unanimously ordered by the Commission that its Secretary immediately deliver said report to the Governor of said State, and that two thousand copies of said report be printed at the office of the State Printer of said State.

Attest:

[SEAL.]

W. R. ANDRUS,
Secretary of the Board of Railroad Commissioners.

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REPORT
OF
COMMISSIONER W. W. FOOTE.
[THIRD DISTRICT.]

REPORT.

BOARD OF RAILROAD COMMISSIONERS OF THE STATE OF CALIFORNIA, }
SAN FRANCISCO, January 19, 1884. }

To his Excellency Governor GEORGE STONEMAN:

SIR: On the seventh day of this month, there was presented to your Excellency, in accordance with the constitutional provision requiring the same, the Report of the Board of Railroad Commissioners for the year 1883. This report was, as I am informed by its author, prepared by Commissioner Carpenter, and as you will observe, is signed by himself and Commissioner Humphreys.

At the time of the presentation of this report to the Board, at an informal meeting, I addressed you a letter, explaining why I did not vote for its adoption, and my reasons for not signing the same; and you were also informed, that so soon as possible I would prepare and send you a report of my own, of the workings of the Commission, setting forth what it had done, and what it had failed to accomplish, during the year immediately last past. This is the earliest opportunity I have had of fulfilling that promise.

THE MAJORITY REPORT.

On the seventh day of January, 1884, at about twelve o'clock noon of that day, I was at the office of the Board of Railroad Commissioners, in the City and County of San Francisco. Commissioners Carpenter and Humphreys were both present. Mr. Carpenter went to his desk, and from one of the drawers thereof drew forth a roll of manuscript, which he presented to me with the remark that this was his report, and as the year within which the report should be filed had about expired, he desired to send it to Sacramento that same afternoon. I took the report and saw, after a moment's perusal, that it would be impossible for me to even read it all casually, much less digest its contents, in the brief time allotted me for the purpose. After reading a few pages, I said to Mr. Humphreys that the report seemed to have been prepared with the idea that I would not sign it, and the remark was made upon the discovery of several passages in the report highly laudatory of the self-styled "majority of one," and reflecting, as I then thought, and still think, very seriously upon the intelligence or good faith of my actions as a member of the Board. Mr. Humphreys said that he had not read the report carefully, but that he would sign nothing which reflected upon me. It is but justice to Mr. Carpenter to state that he expressly disclaimed the intention which I had imputed to him. Mr. Carpenter likewise

informed me that the statistical portion of the report had been carefully compared with the original documents on file in our office, and that it was literally accurate. A few minutes after this conversation occurred (which interval had been occupied by myself in reading that portion of the report which is mainly devoted to a defense of the acts of the majority), all three of the Commissioners went into the next room, which is occupied by the Secretary of the Board, Mr. W. R. Andrus, who was then present. I here announced that, for reasons which were sufficient to my mind, I should decline to sign the report; at this time all three of the Commissioners were standing about the room. Without any pretense of coming to order, Mr. Carpenter moved the adoption of the report, which motion was seconded by Mr. Humphreys with a promptness that somewhat astonished me, recollecting, as I did, that only a few moments before he had stated that he only knew of its contents in a casual way. Such celerity of action upon the part of Mr. Humphreys, touching the adoption of an annual report of the Board, the contents of which he was professedly ignorant of, was at the time, and still is, very mystifying to me. After the adoption of the report, a motion was made to send the same to the Governor, with an order for printing two thousand copies, for which motion I cheerfully voted, as I desired to preserve so valuable a document in a more enduring form than it then was, and also for the reason that I might some day be able to give the contents an attentive perusal, no copy of it having been retained in our office. After these proceedings had taken place, Mr. Carpenter placed the report in my hands, that I might have the Stenographer of the Board take down and transcribe for me such portions of the report as I desired, during the afternoon of the seventh of January, 1884. This service Mr. Girvin performed for me in about an hour, and subsequently wrote out his short-hand notes, which transcription is all I have had to use as the basis of whatever I may have to say concerning the report of the majority. I shall assume the right to criticise this report with the same freedom which has characterized the utterances of the author of the document, when commenting upon my official actions.

ORGANIZATION OF THE PRESENT BOARD.

The three gentlemen elected as Railroad Commissioners at the last general election, Hon. G. J. Carpenter, William P. Humphreys, and W. W. Foote, met at the offices of the old Board-room, on Sansome Street, in San Francisco, on the ninth day of January, 1883. They were received most courteously by Mr. J. S. Cone, one of the outgoing Commissioners, and Mr. Andrus, the Secretary of the Board. Upon motion of Commissioner Foote, Hon. G. J. Carpenter was elected President of the Board, and by the unanimous consent of all the Commissioners, Mr. Carpenter named Mr. John P. Carroll, of San Francisco, as Bailiff of the Board. Mr. Foote then moved that the Board complete its organization by the election of a Secretary, whereupon Mr. Humphreys suggested that Mr. W. R. Andrus act as temporary Secretary, which Mr. Andrus declined to do. After some discussion upon the subject, Mr. Carpenter offered a resolution declaring in effect that Mr. Andrus was legally Secretary until his successor was appointed, for which resolution the President and Mr. Humphreys voted, and since that time Mr. Andrus has continued to per-

form the duties of the office. Mr. Girvin, the Stenographer of the old Board, holds his place, under the present Board, by the same tenure as Mr. Andrus, and, in this connection, I cheerfully bear testimony to the fact that the employés of the Board, one and all, have been faithful, efficient, and obliging in the discharge of their various duties.

CREATION OF THE BOARD.

One of the main reasons, in my judgment, why the present Constitution was adopted, is to be found in the fact that the producing classes of this State were disgusted with the abortive efforts, which for years had been made, to curb corporate rapacity by legislative enactments. The history of every bill introduced, to lessen the burdens of the people, is familiar to every one at all conversant with the subject. Is it true, as has often been charged, that legislative bodies are too strong numerically to formulate any fair scale of railroad rates? Are the legislative sessions too short to give members the time necessary to properly regulate and control the operations of railroads and other *quasi* public corporations? Can it be, as has often been strongly intimated, by persons presumably familiar with the facts, that beneficial legislation has more than once failed to become effective because men, whose votes were needed, have, in railroad parlance, suddenly been "convinced?" Whatever may be the cause, the fact remains, that railroad legislation in California, so far as it was intended to curb the monopolistic tendencies of all corporations of this character, has been utterly fruitless. The people of California, knowing this state of affairs, and desiring to rectify at least this one evil, through their chosen representatives, framed our present Constitution, and presented it for adoption. After a most bitter opposition, it was adopted by a very large majority, considering the means used in the effort to secure its rejection; and one result of its adoption was to create the present Board of Railroad Commissioners, and to endow it with whatever powers it possesses.

JURISDICTION OF THE BOARD.

The majority report contends strenuously in favor of the jurisdiction of this Board to regulate and control railroad corporations in this State, to the full extent of the constitutional grant for that purpose, and a large number of English and American authorities are quoted to sustain the position. To this portion of the report I give my most cordial assent, and only regret that the power has not, in my opinion, been exercised by the present Board to the extent which the abuses to be corrected most certainly warranted.

That the "power of the State" in the matter of regulation of the affairs of railroad and other transportation companies, is "no longer debatable," as stated in the majority report, is a proposition too well established, by a long line of adjudications, to call for any extended notice. Every Court in this country, State and Federal, has promulgated the doctrine until it has gone beyond the realms of controversy, so far as judicial decisions are concerned.

FEDERAL CORPORATIONS.

But certain railroad corporations, notably those which have received Federal aid in lands or bonds, have always combated the

doctrine so frequently announced. They claim to be Federal corporations, although organized under State laws. The principle contended for, seeming to be that the more aid received from the General Government, the less amenable are they to the jurisdiction of the States. The Central Pacific Railroad Company, a California corporation, deriving all of its powers to transact business as an artificial person from the people of this State, has never agreed to the doctrine of State control, and through its principal officers, even now, denies the power of this Board, or the representatives of the people in any other capacity, to regulate its affairs to any extent whatever; even denying the State's power to collect taxes. Judge Sanderson, the chief counselor of the Central Pacific Railroad Company, a lawyer of eminent ability, at one time a member of the Supreme Court, where he discharged his duties with eminent fairness and great ability, is, perhaps, the originator of the doctrine in this State, that "Federal corporations," so called, are above and beyond the control of State authority. So long ago as the year 1872, the Central Pacific Railroad Company declined to pay the taxes assessed against it in the County of Placer. Suit was brought in the District Court of the proper county, for the amount delinquent, and, after trial, judgment was rendered against the company. The case was appealed to the Supreme Court, and the briefs on file are able and exhaustive. Upon the part of the defendant it was contended, in the broadest way, that the Central Pacific Railroad Company, though organized under State laws, yet by accepting the terms of the various Acts of Congress concerning Pacific railroads, became a "Federal corporation," and, for this reason, was in nowise subject to State laws, and was exempt from the payment of taxes for State and county purposes. This doctrine was thoroughly overturned by our Supreme Court; the opinion in this case by Judge Wallace, concurred in by the whole Court, declaring that the Central Pacific Railroad was not a Federal corporation, and must pay its taxes as other corporations or individuals.

This case is reported in the 43 Cal. 398, and is entitled, "*The People of the State of California vs. The Central Pacific Railroad Company of California, and that certain real estate, situated in the County of Placer, and described as ninety-two and one fourth miles of railroad and telegraph line, situate in the County of Placer, and State of California, and known as the Central Pacific Railroad and Telegraph Line.*"

A Writ of Error was refused by our Supreme Court, but granted by telegraph from Washington, as I am informed by Judge Wallace, and the case has since been dismissed, presumably for the reason that the defendant had abandoned the doctrine contended for, or else feared an affirmation of the judgment of our State Court. This was, of course, before our present Constitution, since which time evasion of taxes has been sought, thus far successfully, by reason of the alleged protecting provisions of the Fourteenth Amendment, at one time thought to be a portion of the reconstruction system of Congress; but, if the new doctrine is to prevail, this was an error, and the prime object of that amendment was to prevent hostile legislation against delinquent corporations.

The case of San Francisco and North Pacific Railroad Company vs. The State Board of Equalization, is a decision rendered by our present Supreme Court. The case was brought to test the validity of an assessment of railroad property made by the State Board of Equalization, which assessment was resisted by the corporation defendant

on the ground that the assessment was virtually made in two counties, not by the County Assessors constitutionally elected, and that it was void for the reason that said assessment was in violation of that clause of the Fourteenth Amendment to the Constitution of the United States which provides that "no State shall deny to any person the equal protection of the laws."

The equalization made by the State Board was sustained in a lengthy and able opinion by Judge McKinstry, concurred in by Judges Ross and McKee.

STATE JURISDICTION STILL DENIED.

At several of the public sessions of the Commission held in San Francisco, Mr. Charles Crocker, at my request, appeared before the Board, without a subpoena, for the purpose of being questioned under oath touching matters concerning the roads with which he is identified, which roads, as is well known, virtually include all the railway lines in this State doing any considerable volume of business. Mr. Crocker was usually accompanied by one of the attorneys of the companies which he represented. Upon one occasion, he appeared before the Board together with Judge Sanderson, and for the purpose of ascertaining what were his views upon the subject, I asked him the direct question: Whether, as a matter of fact, he acknowledged the jurisdiction of our Board over railway corporations in this State? Mr. Crocker expressed no desire to evade the answer, but Judge Sanderson, before Mr. Crocker could reply, interposed an objection, which had the effect of preventing any response. My object in asking the question was, of course, to ascertain whether we were dealing with people who acknowledged our jurisdiction, and would obey our lawful orders, or whether we were merely enacting a solemn farce, which could possibly be productive of no good results; the failure to secure an affirmative answer, convinced me, then and there, that whatever our purpose, the ends to be attained by further questioning on this subject would be of no practical value, and I pursued the inquiry no further, being fully convinced that whenever any act of the Board ran counter to the wishes of the Central Pacific Railroad Company, it would be resisted in the Courts to the bitter end. I am still of the same opinion.

It has been frequently asserted, that the jurisdiction of this Board has been acknowledged or acquiesced in by the railroad corporations which have been thus far affected by its orders or schedules. This is a popular fallacy. Mr. A. N. Towne, in a communication addressed to the Board, *accepting, under protest*, the fare schedule adopted by the majority of the Board, which communication appears in and is commented upon in the majority report, thus enlightens us upon the scope of our duties and the extent of our powers:

To the honorable the Board of Railroad Commissioners of the State of California:

GENTLEMEN: On behalf of the Central Pacific Railroad Company I have the honor to acknowledge the receipt of a copy of the order adopted by your honorable body on the twenty-sixth day of June, ultimo, prescribing the rates of passenger fares on the system of railroads owned and leased by it.

The order establishes a maximum of six cents per mile on the desert and mountain portions of the system, and four cents per mile in the valley districts, and adopts all lower rates now charged by us. This official order works many radical changes in the rates of passenger transportation, and we respectfully enter this our solemn protest against its enforcement, and for grounds of protest beg leave to respectfully submit the following grounds of protest:

First—THE STATE OF CALIFORNIA, NEITHER THROUGH ITS LEGISLATURE NOR THROUGH YOU, ITS BOARD OF RAILROAD COMMISSIONERS, HAS JURISDICTION TO REGULATE FARES AND FREIGHTS UPON EITHER THE CENTRAL OR THE SOUTHERN PACIFIC RAILROAD. Both of these roads, as you are aware, have been constructed under Acts of Congress, the former under the Act of Congress of July 1, 1862, in relation to the Union and Central Pacific Railroads, the latter under two Acts of Congress, to wit: the Atlantic and Pacific Railroad Act of July 27, 1866, and the Act in relation to the Texas and Pacific Railway Company of March 3, 1871. By the eighteenth section of the first of said Acts Congress reserved to itself the power to regulate fares and freights upon the Central Pacific Railroad after the income of said road should exceed ten per cent upon the cost of construction, exclusive of the five per cent required to be paid by the company to the United States in liquidation of the loan made by the United States to it, and in the meantime authorized the company to establish its own rates.

By the thirteenth section of the second of said Acts it was provided that the Directors of the Southern Pacific Railroad Company might, from time to time, fix, determine, and regulate the fares, tolls, and charges to be received and paid for transportation of persons and property on its road or any part thereof.

The fifteenth section of the third and last of said Acts provided that the rates charged for carrying passengers and freight per mile shall not exceed prices which might be fixed by Congress for carrying passengers and freight on the Union Pacific and Central Pacific Railroads. And by the nineteenth section thereof it was further provided that no act of the company, nor any law of any State or Territory should impede, delay, or prevent the company from performing its obligations to the United States.

Thus it appears that Congress has reserved to itself full and complete jurisdiction over the regulations of fares and freights upon both the roads in question, and has already, in a measure, exercised such jurisdiction. To this jurisdiction, on the part of the National Government, the State of California, by solemn acts of its legislative body, has fully assented, if such assent was necessary, which we deny.

Said Acts were dictated by a wise policy on the part of Congress. The purpose of Congress in the passage of said Acts was to promote the settlement and development of the country, and to stimulate and encourage the construction of lines of communication between all parts of the national domain. The action proposed by you, and against which we protest, is at variance with this broader policy of the National Government; indeed it will prove, if enforced, the reversal of that policy, by arresting the construction of transportation lines, and thereby retarding the development of the national resources and delaying the process of civilization.

Can any language indicate more clearly than does this, that whenever this Board shall, in the exercise of its legitimate powers, adopt any schedule of fares or freight not acceptable to the railroad companies which Mr. Towne represents, that its enforcement will be resisted to the last extremity. And does it not also suggest the advisability of the immediate adoption of some *real reforms* in railroad management, to the end that the legal questions involved may speedily come before the proper tribunals for final adjustment. I am led to these reflections for the reason that I believe the schedules already in force, by order of this Board, are entirely acceptable to the railroad companies to which they apply; or in other words, as I shall more fully explain and demonstrate hereafter, that the reduction made by said schedules are so immaterial and inconsequential, that the Central Pacific Railroad Company do not care to waste time in opposing them, save by means of *bogus* protests, not intended to influence the Board, but to make a show of apparent fairness to a large class of patrons of the road, who are firm in their belief that for many years they have been the victims of extortion and discrimination, practiced under a method of doing business controlled solely by that pernicious maxim so confidently put forth, of charging "all the traffic will bear." I should forbear to say anything further upon the question of the right of the State to regulate these corporations, subsidized by the Federal Government, but for the fact that I believe that when the regulation is attempted in a way distasteful to the companies it will be the fruitful source of litigation and strife. In my judgment the sooner these questions are brought up and litigated, the better will it be for all parties concerned.

In addition to what is contained in the majority report, and what

I have said herein upon the subject, I beg leave to call to your attention one or two extracts from a recent article in the *North American Review* of September, 1883. The writer is Judge T. M. Cooley, an author quoted with approval in the majority report. The title of the article is:

STATE REGULATION OF CORPORATE PROFITS.

At the time when the Federal Constitution was adopted, municipal government in America was a very simple affair, and was managed with ease and economy through local officers, who provided for the making and repairing of roads, looked after disorderly characters, abated local nuisances, and levied rates for the few and simple public needs. When the growing population of a particular locality appeared to need larger powers of local government, the Legislature granted them, but they often involved little more than the holding of fairs as a means of building up local trade, the institution of a local Court for the trial of petty cases, a few simple precautions against fires, the employment of watchmen, provision for the streets, and authority to levy taxes, under very narrow restrictions to meet the corporate expenses for these purposes. State Government was more complicated, but it was vastly less so than it has since become.

Changes, the most of which have taken place within fifty years, have made everything different. The railroad has come, for good and for evil, and has displaced not only the old stage-coach, but to a large extent also the use for trade and travel of the common roads. The State and its municipalities provide the common highway, and keep it in repair, and it seems, therefore, to be within their authority, if not their duty, now that the railway has become the chief convenience of travel and transportation, to provide that also.

The learned Judge, upon the question of legislative grants of corporate franchises, uses this significant language:

But to grant such a franchise is to give a special privilege, which presumably has pecuniary value. It is, therefore, to prefer some citizens, who are made the recipients of the grant, over citizens in general; and though this is unavoidable, it is in a sense invidious. In many cases, also, the privilege from its nature must be exclusive; and we are to have persons carrying on a business as a public agency, with the public as a customer, but without the competition which, in the case of ordinary business, is supposed to be the sole protection against extortionate demands. We thus have the odious features of monopoly as the result of a grant of a public privilege; and this will be obnoxious in proportion to the opportunity it gives for unjust exactions, and to the neglect on the part of the State to provide against them.

But, suppose the State, when granting the privilege, makes no provision against an extortionate use of it for the purposes of private gain, is it powerless to do so afterward? No question more important than this has hitherto demanded the attention of the country. If the State may grant irrevocable and unchangeable franchises of all sorts, we may find, after a few years of foolish and corrupt rule, that it has bartered away a large part of its ability to be useful to the people, and that, instead of existing for the equal and common good of all, it has built up privileged classes to whom the functions of government have been granted or pledged. It would be easy to imagine a state of things that might become intolerable.

When the force, effect, or binding nature of a public grant, and especially of a corporate grant, is in question, we turn spontaneously to the Dartmouth College case for the light and the law that must guide and govern us. That case has tended to fix in the public mind the impression that whatever can be obtained in the form of a legislative grant has a property character affixed to it, which entitles it to common protection with the earnings of industry and the legitimate accumulations of capital, and that it has also something of the sacredness supposed to inhere in public compacts and treaties, and must be specially guarded for that reason. The decision has been extolled beyond measure for its preëminent wisdom and beneficence; and it has been assumed that without it the protection of contracts would have been impossible, and especially that the prodigious results of corporate organization, which has done so much to enrich and improve the country, could never have been attained. But if the Dartmouth College case brought blessings, it also created alarm; the corporations protected by it acquired a greatness, wealth, and power which the political instincts of the people made them distrust and fear; and in recent Constitution-making they have given distinct expression to the belief that a Legislature with authority to tamper with corporate powers is less to be feared than a Legislature with authority to grant irrevocable franchises and privileges. The revised State Constitutions of recent date have, therefore, taken from the legislative department the power to grant corporate charters, except subject to the unalterable condition, as a part of the contract, that the charter may be altered or repealed in the legislative discretion; and that condition, in the case of nearly all recent corporations, is a part of the law of their being. It has been imposed under the influence of a fear that without it not only were corporations likely to become too powerful for effectual control, but also that the State was in danger of stripping itself for their benefit of essential powers.

There are still some charters, however, that, having been granted without the condition, are not subject to repeal or amendment at the legislative will; there are also important franchises in the hands of unincorporated persons. And in examining the State power to regulate charges,

it seems necessary to consider it first, as it would exist at the common law; second, under charters not repealable or amendable; and, third, under charters which are subject to legislative control.

First—Of the corporations serving public ends, the most important are railways. These are chartered that they may establish the business of carrying for hire the property and the persons of those who may desire that service. This is a business well known to the common law, and has long been recognized as having a semi-public character, which made it an exception to private business in general. The law permitted persons to assume the character of common carriers only upon certain conditions, one of which was that they should carry property at reasonable rates;* and, in the absence of special bargain, the law, when necessary, undertook to determine what might be reasonable rates under the circumstances. But, subject to these and a few other conditions, any one might offer his services as a public carrier; he needed no State permission for the purpose. And no doubt he might build a railroad and operate it in his business, if he could purchase for his track a right of way; but he would operate it under the same common law conditions which other public carriers must observe. He would therefore be under the restriction that his charges should be reasonable. But legislative permission to build and operate a railroad is commonly a necessary requisite. Highways must be crossed and public places intersected or occupied; and a railroad upon any of these, without permission of the State, would be a public nuisance, and subject as such to indictment and removal. It becomes necessary, also, to resort to the eminent domain to force sales of lands for right of way by persons who will not voluntarily part with them, or who take advantage of the circumstances to demand exorbitant prices. But in addition to other impediments to individual construction, the capital required for the purpose is so great that only the coöperation of many persons can secure it; and the safe and convenient method of coöperation is under corporate forms. We therefore, of necessity, have charters for railway companies.

As to the principles upon which this regulation should be made, and the various facts which may be taken into consideration in performing that duty, Judge Cooley says:

We have, then, railway companies existing as common carriers, and subject to the common law obligation to make only reasonable charges. But what are reasonable charges? Reasonable prices in general are such prices as are determined by demand and competition; and they do not necessarily lose their character as reasonable, because under the pressure of demand and in the absence of competition, they become very profitable. If, therefore, a railway corporation is to be regarded as occupying in all respects the position of a common law carrier, large profits will not necessarily determine its charges to be unreasonable. *But when the company receives from the State special privileges and grants of power, on the understanding that these are conferred in the public interest and to subserve public ends, it is not by any means certain that its profits may not justly be used as a test of the reasonableness of its charges. The charter is granted for the mutual benefit of the State and the corporators, and while it contemplates reasonable returns to the latter on their investment, it cannot fairly be understood to contemplate anything more.* In determining what are such terms all the risks to which the investment is subject are to be taken into account; and it is obvious that these are much greater than the risks which attend the loaning of money on security. But charges can only be regulated for the future; and this must necessarily be done, either by the company itself or by the State, upon estimates of the business likely to be done, and its cost. That the company could not be exclusive judge in doing this, even at common law, has already been seen; and as no third power can intervene, except by mutual consent, it seems to follow of necessity that the State may limit profits as well as charges. The judicial decisions go to this extent, that when the State establishes a maximum of charges, these charges are to be deemed *prima facie* at least reasonable.†

A PRINCIPLE OF ACTION STATED.

The italics in this extract are my own. The principle stated is one upon which I have consistently acted, and which I have persistently sought to establish as a basis of action by the Board, since entering upon the discharge of my official duties. I believe it to be just and equitable. That "special privileges and grants of power," together with the donation of immense land grants, together with governmental aid in the shape of Government bonds, with interest guaran-

* *Harris vs. Packwood*, 3 Taunton, 264; *Oppenheim vs. Russell*, 3 Bos. & Pul. 42; *Ashmole vs. Wainwright*, 2 Q. B. 837; *Fitchburg R. Co. vs. Gage*, 12 Gray, 395; *McDuffee vs. Railroad Co.*, 52 N. H. 430; *Johnston vs. Railroad Co.*, 16 Fla. 623; *Holford vs. Adams*, 2 Duer, 471; *Streeter vs. Railroad Co.*, 45 Wis. 383.

† *The Granger Cases*, 94 U. S. Reports, 155, 164, 179, 180, 181; *Shields vs. Ohio*, 95 U. S. Reports, 319. As to the elements of reasonable charges, see *Pickford vs. Grand Junction R. Co.*, 10 Mee. & W. 399.

teed, are facts which should be taken into consideration in fixing rates of fares and freights, seems to me to be a proposition which is established by the mere statement of it, and one which no argument could strengthen. Yet these principles have been frequently disputed by the majority of this Board, and in their report they are distinctly and flatly repudiated as worthless, for Mr. Carpenter, in his fifth subdivision or statement of governing principles acted upon by Mr. Humphreys and himself, thus states his views:

Fifth—This is the rule of compensation for Government service incorporated in the Acts of Congress to aid the construction of the Central Pacific and other overland roads, and estops the Government and *a fortiori* all other parties, from discriminating against them in payments for transportation thereon.

In commenting upon the action of a former Board, Mr. Carpenter thus expresses himself :

It includes the established tests, not themselves disputable, by which all Courts and Commissions, State and National, are necessarily governed. Without preference of person or corporation, owning and operating railroads, they apply to all alike, and relate to service and not to subsidies; to the continuing basis of charges for fares and freights, and not to the financial backing nominated in Government bonds; to the present condition of existing railroads, and not to the eventful epoch when gigantic forces of peace and war conspired to build them. Opposed to these principles and conclusions of law, there is only the unreconciled afterthought that Government loans and donations for the construction of the Central Pacific and other overland roads were or might have been intended as offsets to charges for their operation.

The excessive floridity of this extract slightly clouds its meaning, and the business principles stated are somewhat obscured by the rhetorical flourishes under which they are buried. If I understand it, however, it means what I have always understood from the public discussions held by Mr. Carpenter and myself, that the "majority of one" will not consider the fact that the Central Pacific Railroad was largely aided by the Government, if not entirely built by the means provided by it, when this Board is fixing rates of freights and fares to be charged by that corporation. From this conclusion I most emphatically dissent. If this principle is eliminated from the inquiry, the relief to be afforded by this, or any other Railroad Commission in this State, would be of so futile a character as to scarcely justify the expense of keeping so costly a governmental appendage in existence. Judge Cooley certainly had these land grant and subsidized railroads in mind, when he says that "*the charter is granted for the mutual benefit of the State and the corporators; and while it contemplates reasonable returns to the latter on their investment, it cannot be fairly understood to contemplate anything more.*" That the magnificent endowment of the Central Pacific Railroad by the Federal Government, and its acceptance of the same, together with the princely liberality of the State of California, and several of her counties, were "intended as offsets to the charges for their operation," was certainly contemplated by the donors, whatever may have been the idea of the recipients of these bounties. That these gratuities were intended for the sole use and benefit of the individual incorporators, is a proposition boldly advanced and plausibly maintained by the author of the majority report, if I correctly understand the language quoted from that document. It is a principle of action to which I can never give my assent, for all contemporary legislative history shows the converse to be true.

HISTORY OF PACIFIC ROADS.

When "gigantic forces of peace and war conspired to build" these overland roads (which is the history and mode of their construction according to the majority report), the individuals who now control one of them, and who have accumulated enormous wealth by reason of that control, were all men of moderate means, but of indomitable energy and will. The California corporation which they formed, under the various Acts of Congress relating to these matters, was authorized to build a certain portion of the line, and for so doing was to receive, and did receive, aid, in the shape of a land grant and bonds.

The land grant of the Central Pacific Railroad which it has actually secured, amounted to *twelve million acres*. They were aided with the gift of bonds, at that time constituting a first mortgage on the road, to the extent of *twenty-seven million dollars*. Subsequently, it was represented to the Congress of the United States, that the aid granted, together with the private fortunes of the incorporators, was insufficient to complete the line. Congress allowed the Central Pacific Railroad Company to issue its own bonds, in an amount equal to the Government bonds which had been loaned. It was claimed that these bonds could not be sold, even at a sacrifice, for the reason that the Government was the holder of the first mortgage or lien upon the road. Capitalists, in this country and Europe, could not be found to purchase the second mortgage bonds of an enterprise the final success of which, to say the least, at that time, was doubtful. To relieve the projectors and builders of the Central Pacific Railroad from a financial dilemma which threatened to prevent, or, at least, greatly delay the completion of the road, Congress, with a generosity in giving away trust securities hitherto unparalleled in any legislation with which I am familiar, gave up the Government's first mortgage on the road, taking a second mortgage as security for the Government loan of twenty-seven million dollars, and allowing the company's bonds to be secured by a first mortgage upon the property. Even the funds raised by the sale of both the Government and company bonds, together with a large sum secured by the sale of *ten million dollars* of land grant bonds, we have been told by the officers of the company, did not nearly suffice to pay for building and equipping the road, constructed, as it mainly was, by the Contract and Finance Company, an institution which is generally supposed to have lost nothing by the contracts which it had taken. Where the many millions, said to be needed to complete the road, were obtained, is a piece of information which the company's reports fail to show, and diligent inquiry in other directions has not elicited the desired information. It did not come from the sale of stock, and was not furnished from the private fortunes of the owners. I call your attention to these facts at this time (I shall recur to them again in another connection), for the purpose of showing, if I can, the fallacy of the principle contended for and acted upon by the majority of this Board, that they should not be taken into account when the fixing of "rates" and "rates of charge" for these roads is under consideration. I do not contend, nor have I ever done so, in discussions in the Board, or elsewhere, that these are the only considerations which should govern the Board in its action towards these roads. Most certainly the

interest upon the bonds must be earned and paid, and a fair profit to the owners; but is it right that immense private fortunes should be earned every year besides. In brief, then, the idea I intend to convey is, that subsidized railroads, built upon the credit of the Government mainly, should be regulated upon somewhat different principles than those applying to roads which are merely chartered by the State, but constructed entirely by private capital. And the fact that the main lines in California are all subsidized renders the duties of this Commission more onerous than, perhaps, those of any other which has yet grappled with the subject of railroad regulation.

Mr. Carpenter, in that portion of his report which is devoted to a citation of authorities intended to sustain the position taken by the majority, quotes from an Act of Congress granting certain favors and imposing certain duties upon subsidized roads. Regarding the compensation to be paid by the Government for service performed for it by subsidized roads, the Act, as quoted in the majority report, says it shall be "at fair and reasonable rates of compensation, not to exceed the amounts paid by private parties for the same kind of service."

Mr. Carpenter's report, commenting upon this language, is as follows:

Here again is the common law rule of service, and for the same kind of service the same compensation. This would be plain enough without the express limitation to amounts paid to private parties whose rights are not affected by anything in the contract. And in an opinion upon the clause quoted, the Supreme Court of the United States has said: "The compensation at fair and reasonable rates must be considered upon all the facts material to the issue, not to exceed the amount paid by private parties for the same kind of service." (*Union Pacific Railroad Company vs. The United States*, 14 Otto, 667.)

Nothing, therefore, can be more evident than that the brilliant conception of reversionary bounties, and loans payable to the Government, but due to everybody, and subsidies that are a perpetual surcharge of fares and freights, was inspired by the wisdom that comes after the fact.

The extracts just quoted from the Act of Congress convey to my mind a meaning entirely different from that placed upon them by the author of the majority report. It is perfectly true that the Act was guarded to the extent that subsidized roads, in their dealings with the Government, were limited to a rate of charge not greater than that exacted from private individuals. Thus far the Government protected itself and no farther, for it did not pretend to fix the rate of charges specifically for all time, but simply said that they should be "fair and reasonable," leaving the construction of those terms to whatever agency should be intrusted with the power of defining what was "fair" and what was "reasonable" in each particular case. In this State that agency is the Board of Railroad Commissioners.

It was undoubtedly assumed that the States would regulate the charges so far as they could, and that the limit thus fixed, so far as the service was the same, would apply to the Government in its employment of the roads.

The Congress of the United States undoubtedly has the power to fix the rates for overland traffic, if it is inter-State commerce, under the Twelfth Amendment to the Constitution of the United States. Already a bill has been introduced by Mr. Sumner, of California, limiting the rates of fare upon the Union and Central Pacific Railroads to the sum of *three* cents per mile, which is ample; this will undoubtedly be followed by another concerning freight rates. If Congress should fail to act upon these measures, a National Commission, with full power to control the whole subject of through rates

between different States, and also to apportion rates between the roads themselves, would be a solution of the difficulty. Legislation of this character is imperatively needed, and without it State authority, however honestly exercised by those to whom it is intrusted, is powerless to correct many of the abuses which now exist.

BRIEF HISTORY OF CALIFORNIA RAILROADS.

The appendix to the report of the majority of this Commission, contains a large number of documents, but not one third of the number which have been presented to the Board during its brief year of existence. Some of these papers are valuable for the information they contain, others are utterly worthless for practical purposes, whilst others still are curious by comparison with documents relating to Central Pacific Railroad matters presented at a time when the people were clamorous for the completion of the Pacific Railroad, and lavishly generous to that corporation. It is impossible at this time to name the person who is entitled to the credit of having originated the idea of building a Pacific Railroad. The Treaty of Guadalupe Hidalgo, which ended the Mexican war and resulted, among other things, in the acquisition of the territory now contained in the State of California, was concluded on the second day of February, in the year 1848. About the same time, to wit: on the nineteenth day of January, A. D. 1848, the discovery of gold induced a flood of immigration to California, which in less than a year so increased the population, that the young and lusty Territory was clamoring at the doors of Congress for admission, as one of the sisterhood of States, into the Federal Union. The old pioneers of early days, who had a vivid recollection of the hardships encountered and perils endured in the long and weary march across the plains, or the equally perilous route *via* Cape Horn, and the shorter but no less dangerous journey by the Isthmus of Panama or Nicaragua, were constantly dreaming of the day when a railroad across the continent should be completed, but few of them had any idea of living to witness the realization of their hopes. For many years those who talked of the feasibility of such a road were deemed mere theorizers. It had always been contended that such an undertaking could only be successfully finished by the General Government, private capital and individual effort being rightly deemed (save by a few whom events have shown to have been mistaken,) inadequate to inaugurate, much less to complete, the work. As early as the month of January, 1857, Theodore D. Judah, Esquire, a practical civil engineer, then a resident of San Francisco, and subsequently one of the incorporators of the Central Pacific Railroad Company, and its Chief Engineer, wrote and published a lengthy pamphlet entitled "A Practical Plan for Building the Pacific Railroad." As containing the first proposal for the completion of such a work, I quote the following extract:

The project for construction of a great railroad through the United States of America, connecting the Atlantic with the Pacific Ocean, has been in agitation for over fifteen years. It is the most magnificent project ever conceived. It is an enterprise more important in its bearings and results to the people of the United States than any other project involving an expenditure of an equal amount of capital. It connects these two great oceans. It is an indissoluble bond of union between the populous States of the East and the undeveloped regions of the fruitful West. It is a highway which leads to peace and future prosperity. An iron bond for the perpetuation of the Union and independence which we now enjoy. Many projects for the prosecution of this enterprise have been presented. Various schemes for the fulfillment of these

projects have been devised. Our wisest statesmen, most experienced politicians, scientific engineers, and shrewdest speculators have each and all discussed the subject in nearly every point of view, and given the results of their wisdom and experience to the world. Yet their projects have proved abortive. Their schemes have failed. The world has listened with attentive ears to the words of eloquence and wisdom from the lips of great and wise men. Yet this project has not been consummated. The road has not been finished. It has not been begun. Its practicability has not been established. A survey has not been made. It has simply been made the subject of reconnaissance.

Still, during the last twenty-five years, twenty-five thousand miles of railroad have been constructed in the United States, and a thousand million of dollars expended thereon. This road is but two thousand miles in length, and its cost not over say \$150,000,000. As many as eight or ten great avenues of transit between the present East and West (three of which, in the State of New York alone, cost one hundred million of dollars) have been constructed. This highway, the greatest and most important of them all, remains unbuilt; it may be said unsurveyed, simply reconnoitered. Why is this? Its popularity is universal. Its importance admitted. Its practicability believed in. Its profitableness unquestioned. Firstly, it is because these projects are speculative in their nature, and the people are disposed to look with distrust upon grand speculations; secondly, there are different routes, advocated by diverse interest, each eager that the road be built to subserve its own particular interest, but unwilling to make common cause upon a common route; thirdly, from the lack of confidence in private capitalists, dissuading them from investing in any project through which they cannot see their way clear.

This plan assumes to obviate these objections, and firstly, to build the Pacific Railroad; secondly, to accomplish the same in ten years; thirdly, to raise the capital therefor.

And suggests practical means for the accomplishment of its object by means of private capital. It assumes, that without the confidence of the people, the road cannot be built. Therefore, it proposes to divest the project of its speculative features, and thereby endeavor to inspire the public with confidence. To do this, therefore, *its direction and destiny must not be controlled by a grand stock jobbing company, whose united aggregate wealth will not pay one per cent upon their magnificent subscriptions.*

Secondly—To divest it of the difficulties consequent upon sectional prejudices, it is proposed to ask aid of no kind whatever from the General or State Government, but to combine the interest of either the Northern or Southern States, upon their favorite route; to ask for private capital, and confine the sphere of action entirely to one or the other of these sections. This insures unity of action. The experience of all legislation in this country upon a subject of general interest, but arousing sectional prejudices, shows conclusively that the fate of a project of this nature, dependent upon the general will, is most likely to prove an unhappy one. No one doubts that a liberal appropriation of money or public lands by the General Government ought to insure the construction of this railroad, but the proposition carries the elements of its destruction with it; it is the house divided against itself; it cannot be done until the route is defined; and, if defined, the opposing interest is powerful enough to defeat it.

As is well known, Mr. Judah's plan of building the road, by means of private capital, was eventually abandoned, and Government aid was invoked and obtained. Whether he intended to make a prophecy or convey a warning by the use of the following language, I have no means of determining: "*To do this*" (*i. e., build the road*), "*therefore, its direction and destiny must not be controlled by a grand stock jobbing company, whose united aggregate wealth will not pay one per cent upon their magnificent subscriptions.*" This was written before Mr. Judah became associated with Governor Stanford and Messrs. Crocker, Huntington, and Hopkins.

Early in the year 1859, the Senate and Assembly of the State of California passed a concurrent resolution upon the subject of a "continental railroad from the Pacific Ocean to the Mississippi River," with a request that the Governor of the State send copies of the same to the Governors of Oregon, Washington, and Arizona Territories. With this request the Governor complied, and, in the month of October of the same year, 1859, there assembled in the City of San Francisco, in accord with the suggestion of the resolution, a "Pacific Railroad Convention," composed of delegates from the States of California and Oregon, and the Territory of Washington. It remained in session for five days. Hon. John Bidwell was its President, and William Rabe its Secretary. Among its prominent members were Theodore D. Judah, since deceased, Hon. J. B. Crockett, William H. Rhodes

("Caxton"), Hon. J. G. McCallum, D. O. Mills, Henry Gerke, Hon. L. Archer, since prominent as an advocate of legislation intended to regulate railroads in California, and now a resident of San José; Hon. John Conness was also a member, as likewise L. A. Booth. The name of no man now prominent in railroad affairs in California appears as a member of that Convention, or as interested in its deliberations, except that of R. P. Hammond, one of the present Police Commissioners of San Francisco, and officially connected with railroad matters. The deliberations of this Convention culminated in the preparation and presentation of a memorial to Congress, setting forth the advantages of the contemplated road, and suggesting a plan of subsidizing such a line, which has been substantially followed in all subsequent legislation upon the subject. The three first headings of that memorial are as follows:

First—That the Government aid the construction of the Continental Railroad across the territory of the United States by the guaranty by the Government of the payment of interest, not exceeding five per centum per annum during twenty years, on the bonds which may be issued by the company constructing the said road, representing a sum not exceeding the actual cost of the road.

Second—That the Government grant liberally from the public lands of the territory over which the said road shall pass, to such company or companies as shall construct the same from the western frontier of the Atlantic States to the eastern frontier of the State of California.

Third—That in such grant of lands, the Government offer a *bonus*, conditional, to wit: If the company construct the said road, and put the same in complete operation within five years from the date of the contract, grant to the company alternate sections *thirty* miles deep on each side of the road; but if the company occupy a longer period of time in its construction, grant them only *ten* sections deep.

ORGANIZATION OF CENTRAL PACIFIC RAILROAD COMPANY.

On the twentieth of May, 1861, there was passed by the Legislature, and approved by the Governor, of the State of California, an Act with the comprehensive title of "An Act to provide for the incorporation of railroad companies and the management of the affairs thereof, and other matters relating thereto." Under this Act and the general incorporation law of 1850, the Central Pacific Railroad Company of California was incorporated. The Act of 1861 provided, among other things, the way in which the State and counties and cities could grant subsidies to railroad companies.

The "Articles of Association," as they were termed, under which the Central Pacific was first organized, were filed in the office of the Secretary of State, at Sacramento, on the twenty-eighth day of June, 1861. The "names of the nine Directors who were to manage the concerns of the company," inserted in the articles, were as follows: Leland Stanford, Charles Crocker, James Bailey, Theodore D. Judah, L. A. Booth, C. P. Huntington, and Mark Hopkins, of Sacramento City, D. W. Strong, of Dutch Flat, and Charles Marsh, of Nevada. The capital stock of the company was nominally \$8,500,000, "divided into shares of one hundred dollars each." There were six individuals who subscribed for one hundred and fifty shares each, and their names were: Leland Stanford, Mark Hopkins, James Bailey, Charles Crocker, C. P. Huntington, and Theodore D. Judah, all put down from Sacramento. None of the other subscribers to the stock took more than fifty shares each, and the majority of them were content with five and ten shares. Three of the gentlemen who had subscribed for the larger blocks filed with the Secretary of State the following affidavit on the day the document bears date:

STATE OF CALIFORNIA, }
CITY AND COUNTY OF SACRAMENTO. } ss.

Be it remembered, that on this twenty-seventh day of June, 1861, personally appeared before the undersigned, a Notary Public in and for said city and county, Leland Stanford, Mark Hopkins, and C. P. Huntington, three of the Directors of the within named "Central Pacific Railroad Company of California," and being by me duly sworn, say: That the stock to the amount of at least one thousand dollars for every mile of the railroad intended to be built by said company, to wit: An amount of stock, exceeding one hundred and fifteen thousand dollars, has been in good faith subscribed by the members of said company, and that ten per cent on the amount of stock subscribed, as aforesaid, has been actually, and in good faith, paid in cash to Mark Hopkins, the Treasurer appointed by the Directors named in the within articles of association, and that the subscribers to said articles of association are known by some one of said affiants to be subscribers thereto, and to be the persons so represented.

LELAND STANFORD.
MARK HOPKINS.
C. P. HUNTINGTON.

I hereby certify, that the foregoing affidavit was duly subscribed and sworn to by said Leland Stanford, Mark Hopkins, and C. P. Huntington by and before me the day and year aforesaid. In testimony whereof I have hereunto set my hand and official seal this twenty-seventh day of June, A. D. 1861.

[SEAL.]

ELIJAH SWIFT,
Notary Public.

It will be observed that the "amount of the investment" of private capital, by the present owners of the Central Pacific Railroad Company, was rather small by comparison with the magnitude of the undertaking in which they were about to engage. This organization was completed thus early to enable the California company to take advantage of an Act of Congress subsequently passed, by the terms of which Acts, and the Acts supplemental thereto and amendatory thereof, the grants of lands and bonds to the Union and Central Pacific Railroads were made.

Prior to the passage of the first Act of Congress relating to Pacific railways, the civil war had commenced. All of the Southern States had passed ordinances of secession, and were represented in the Congress of the Confederate States, and some of the Border States had Representatives in the Congress of the United States and also in that of the Southern Confederacy. The immediate commencement and speedy completion of the Pacific railroads, was then strongly and favorably urged, under the convincing plea of "military necessity."

During this period (between the time of the organization of the Central Pacific Railroad Company and the passage of the first Act of Congress granting right of way and subsidies), the projectors of both branches of the continental railway were busy urging their schemes in Washington. Theodore D. Judah spent many months at the National Capital, urging, with all his skill, the immediate passage of the necessary Congressional enactments. Prior to this time he had made preliminary surveys, in person, of the proposed route or routes from Sacramento to the California State line, and beyond, and was prepared, therefore, to demonstrate to the satisfaction of Congress the feasibility of the work which he was so plausibly urging the Government to assist in commencing. At this time, Mr. Judah was also one of the incorporators and directors of the Central Pacific Railroad Company, and was its Chief Engineer. In a pamphlet of thirty pages, printed by H. S. Crocker & Co. in Sacramento, in September, 1862, addressed to the "President and Directors of the Central Pacific Railroad Company of California," Mr. Judah gives an account of his "Operations in the Atlantic States." The subject-matter of this pam-

phlet is a full and complete account of Mr. Judah's work before Congress, in support of his road, which was now to be built at the expense of the Government and not by "private capital," as was originally proposed by himself. Mr. Judah's report is an interesting account of long, arduous, and efficient service in the cause of this corporation, and in it is contained a testimonial to his industry and ability in furtherance of his design, to which is appended the signatures of *forty-seven Congressmen, seventeen Senators*, and the Secretary of the Senate, Hon. John W. Forney. A perusal of the names appended to the testimonial is interesting at this time. First on the list of Congressmen appears the name of R. Franchot, then a member of Congress from New York. This is the same gentleman who was subsequently the lobby agent of the company in Washington, and he is, as far as I have observed, about the only person spoken well of by Mr. Huntington in his recently published correspondence. Erastus Corning, Schuyler Colfax, Thaddeus Stevens, William Windom, W. A. Wheeler, Frank Blair, and Elihu B. Washburn, all members of the lower House of Congress at that time, likewise indorsed Mr. Judah's faithfulness and efficiency. So, likewise, did Hon. T. G. Phelps of California, and Geo. W. Julian of Indiana, since so pronounced an advocate of the policy of retaining the public lands for actual settlers.

Among the Senators whose names appear upon the testimonial of Mr. Judah are those of B. F. Wade, H. B. Anthony, Jas. A. McDougall, Milton S. Latham, Edgar Cowan, L. M. Morrill, and Lyman Trumbull. The appearance of the names of such men as these, all of whom understood Mr. Judah's plan for a people's road, not to be controlled as he expresses it "by a grand stock-jobbing company whose united aggregate wealth will not pay one per cent upon their magnificent subscriptions," is evidence of the fact that in their inception at least, the Continental roads were viewed as a national highway, in which the Government had an interest, and over which it proposed to exercise control. Facts like these are conclusive to my mind in favor of the policy of at least taking them into consideration, when fixing "rates" and "rates of charge" upon the roads to which they relate. They are doubtless as familiar to my associates as to myself, and I regret that they have not been as convincing to them as they have been to me.

During the many trips of Mr. Judah to Washington he was materially assisted by the Hon. A. A. Sargent, then a member of Congress from California. On the thirty-first day of January, 1862, this gentleman delivered a speech in Congress in favor of subsidizing these roads, which was printed and circulated at the time, in furtherance of the enterprise, under the following title:

"SPEECH OF HON. AARON A. SARGENT, OF CALIFORNIA, ON THE
PACIFIC RAILROAD AS A MILITARY NECESSITY."

It was carefully prepared, after a full examination of Mr. Judah's reports of preliminary surveys and estimated cost, and I make from it the following extracts:

The bill which I have had the honor to introduce in this House contemplates the issuance by the United States of bonds to be loaned to the company at a fixed amount per mile, being about one half the contemplated cost of the road, upon the completion of continuous sections of twenty-five and fifty miles; also, a grant of alternate sections of the public lands for six miles upon either side of the road.

Although I have long been in favor of a different plan or mode of granting aid, yet, inasmuch as the scheme I have named appears to have been the one adopted by the committee at their last or thirty-sixth session, it having been thoroughly discussed and finally approved by the House, I felt almost instructed to conform to the thus expressed ideas of the House upon the subject, and accordingly introduced a bill in conformity thereto. Under that bill, I think it can be successfully demonstrated that no great additional burden will be laid on the treasury of the United States for many years to come. As before stated, the bill provides that upon the completion of sections of a certain length, the United States shall issue their bonds at a certain rate per mile to the company; also issue to them the lands appertaining to such completed section or division. At the rates proposed, it is likely that the *total* amount of bonds issued will be about sixty millions of dollars. But it must be borne in mind that those bonds are not to be issued at once. At least one year after the passage of the bill will be consumed in making the necessary surveys and in preparing for work, and it will not be until at the expiration of the second year that any bonds will be called for. If we assume the length of the road to be two thousand miles, to be completed in ten years, this will require the completion of an average length of two hundred miles per year. If we assume the whole cost to be sixty millions, then there will be required the issuance of six millions of dollars per year, the interest on which, at six per cent, will be three hundred and sixty thousand dollars per year.

Mr. Sargent, therefore, contemplated that the aid granted in bonds would about pay half the costs of construction of the whole continental road, the length of which he estimated at two thousand miles from Council Bluffs, Iowa, to Sacramento, California. The amount of bonds, therefore, proposed to be issued, was \$60,000,000, "about one half the contemplated cost of the road," which sum multiplied by two would make \$120,000,000 as the entire cost.

At a subsequent time, on the ninth day of April, 1862, Mr. Sargent delivered another speech in the House of Representatives during the discussion of "House Bill 364," which was entitled "An Act to aid in constructing a railroad and telegraph line from the Missouri River to the Pacific Ocean," etc., being the same bill subsequently passed, and under which and its amendments these roads were built. Mr. Sargent then expressed himself as follows:

A company has been organized in my State, and a railroad survey made under its auspices at great cost, entirely across the Sierra Nevadas, which successfully overcomes the difficulties of this portion of the route. As this company is named in the bill as one of the agents to effect the will of the Government, it may be expected that I shall state what I know of its character. The company is incorporated under the name of the Central Pacific Railroad Company of California, and is composed of some of the wealthiest, most respectable, and reliable citizens of the State, who have taken hold of this matter with vigor and energy, and who are ready to embark their own means in the enterprise, providing the assistance of the Government can be had. Having already surveyed their portion of the line through the State, they are prepared to commence immediately the work of construction, having, as it were, already commenced and performed nearly two years' work in preparing the line for construction, which labor and time would have been requisite after the passage of this bill before the work could have been commenced, as no portion of the line could have been worked until the *whole route* across the Sierra Nevadas had been established and found practicable. The route is located upon a continuous divide which reaches to the summit without being broken by cross ravines or rivers.

Mr. Judah's estimate of the whole cost of the Union and Central Pacific Roads, which estimates were made after preliminary surveys made by himself, and likewise from estimates made by Army Engineers under direction of the Government, was somewhat less than Mr. Sargent's, but the latter was doubtless giving the *highest possible estimated cost* obtainable from authentic sources.

In his report of the cost in a pamphlet entitled "*Report of the CHIEF ENGINEER on the preliminary survey and cost of construction of the CENTRAL PACIFIC RAILROAD of California across the Sierra Nevada Mountains from Sacramento to the eastern boundary of California,*" Mr. Judah gives some interesting facts and figures. It is dated October 1, 1861, and addressed to "The President and Directors of the Central Pacific Railroad Company of California," and opens as follows:

"Gentlemen: Agreeably to your instructions I have completed the preliminary survey of a railroad across the Sierra Nevada Mountains, from the City of Sacramento to a point on the Truckee River at the eastern base of the mountains; the results of which confirm the facts established by the barometrical reconnoissance made last Fall." It appears from this that the work had been twice gone over and the results were doubtless reliable. In this report Mr. Judah gives a complete summary of grades, curves, tunnels, culverts, bridges, and everything entering into the cost of construction, also tables of costs of other expensive works in the United States, Europe, and India, and likewise takes into account the war prices of the materials to be used. The following is his recapitulation of the mileage and entire cost:

Recapitulation and Estimate of Entire Cost of Pacific Railroad Line, taking Lieutenant Beckwith's Estimates from Council Bluffs to Lassen's Meadows, and thence via this route to Sacramento.

	Miles.	Cost per Mile.	Total.
Council Bluffs to Black Hills -----	520	\$35,000	\$18,200,000
Black Hills to South Pass -----	291	75,000	21,825,000
South Pass to Fort Bridger -----	131	50,000	6,550,000
Fort Bridger to Salt Lake -----	173	60,000	10,380,000
Timpanogos Cañon -----	10	150,000	1,500,000
Salt Lake to Lassen's Meadows -----	451	45,000	20,295,000
Lassen's to Big Bend, Truckee -----	104	60,000	6,240,000
Big Bend to California State line -----	38	66,000	2,500,000
State line to Sacramento -----	140	88,428	12,380,000

Total length, 1,858 miles; total cost, \$99,870,000.

It will be seen from this estimate, that the whole Continental road, nearly two thousand miles in length, was to cost less than one hundred million dollars, or an average cost of \$53,751 per mile. Mr. Towne's statement of the cost of the Central Pacific, much less than half the whole distance, makes the actual cost of that road alone the enormous sum of \$138,553,459, more than three times the cost estimated by Mr. Judah. There are many ways of accounting for this great difference between estimated and actual cost, which will readily suggest themselves to the inquiring mind. As I have endeavored to show, the actual cash cost of the roads to the railroad companies is one important element to be considered in fixing rates. Thus far it has been impossible to ascertain this cost. The Act of Congress granting them aid provides that when their net earnings exceed ten per cent of their actual cost, then Congress may reduce the rates of charge to be allowed them. The net earnings of their roads now, and for a long time heretofore, have largely exceeded this ten per cent, but the books of these corporations are so kept, and the amounts earned so frittered away by excessive operating expenses, and in other ways, that the precise figures cannot be obtained. Therefore the reductions proposed by myself were not based upon any actual figures, because they could not be obtained, but they were based upon authentic estimates, and the reductions are not greater than ought to be made.

The companies having been organized, the probable cost of the roads reliably ascertained, and the means having been provided by the Government for prosecuting the work successfully, it was commenced at both ends of the line, and carried on by the Union and

Central Pacific Companies with unexampled skill and rapidity. But my purpose now and hereafter is to deal only with the California corporation.

WORK COMMENCED ON THE CENTRAL PACIFIC.

On the sixth day of November, 1862, the City of Sacramento granted to the Central Pacific Railroad Company and its assigns the right of way through the city, together with "all the right, title, interest, and estate which the City of Sacramento, or the City and County of Sacramento" had to a tract of land known as "Sutter Lake," or "the Slough." A large portion of this slough has since been filled in, at great expense, and is now utilized for depots, machine shops, and other purposes.

Ground was broken at the City of Sacramento on the eighth day of January, 1863, and the occasion was made one of public importance and general rejoicing. Contracts for constructing it were at first let in subdivisions, but this had been found by the managers not to their satisfaction, and the Central Pacific Railroad Company, by appropriate resolution, let the contracts to C. Crocker & Co. Such was Mr. Crocker's testimony before the Board. Mr. Judah's report concerning the letting of these contracts to Mr. Crocker, states that the first eighteen miles from Sacramento, eastward, were thus let for the sum of \$400,000. In the year 1883, on July first, Mr. Judah, as Chief Engineer, submitted an estimate to the Directors as to the probable cost of the road. It will be observed that this was during the war, and the contracts had been entered into for completing the first eighteen mile section, including the American River Bridge. Mr. Judah's estimate, with contracts already let before him, is found on page eighteen of his report referred to, and is as follows:

Approximate Estimate of the Total Cost of First Division of Fifty Miles of Central Pacific Railroad of California.

Total cost of grading, masonry, bridging, ties, and track-laying of Sections 1 to 18, inclusive, as per existing contracts	\$400,000
Total cost of grading, masonry, bridging, ties, and track-laying of Sections 19 to 50, inclusive, as per proposals received from contractors	1,833,896
Total cost of iron rails, locomotives, engines, passenger, freight, and baggage cars, turn-tables, switches, and frogs, and machinery for machine shop	721,000
Total cost of buildings, machinery, right of way, and engineering	175,000
Contingencies	89,600
Total cost of First Division of fifty miles	\$3,221,496

For detailed estimates of the above, as also the actual cost of grading, masonry, etc., already performed, you are respectfully referred to accompanying schedules, marked D, E, and F.

On the twelfth day of last April, Mr. Charles Crocker was before the Board of Railroad Commissioners for examination. With the above estimate before me, which was also shown to Mr. Crocker, I questioned him at some length, in the vain endeavor to find out what was the actual cost of the road. His testimony upon that occasion was substantially as follows:

The witness testified that he had taken the contract to build the road through to the State line. At first the contracts had been let in subdivisions, but it had been found, after trial, that the road could not be built in that way. Some of the subdivisions would be finished and others not. The Central Pacific Railroad Company had therefore passed a resolution letting the contract to him. He had performed the work. After the examination had proceeded some time Mr. Crocker objected to giving further evidence upon the subject. He thought the testimony

was irrelevant. He was willing to swear to all the report of Huntington taken from the books, but he refused to swear to any estimates of Chief Engineer Judah. The actual cost could be ascertained from the company's books. He demanded a ruling upon the relevancy of the testimony.

MR. FOOT: He was conducting the examination to ascertain the cost of the road. Judah said C. Crocker & Co. had taken the contract to build the first eighteen miles of the road from Sacramento for \$400,000. He wanted to know from the witness whether these things were correct.

PRESIDENT CARPENTER said he would not like to rule out any testimony likely to show remotely the cost of the road, the point the Commission was trying to ascertain.

MR. FOOT: It appears here that the cost of locomotives was to be \$10,000 apiece?

MR. CROCKER: Yes, that shows the ridiculousness of Judah's estimate. We were obliged to pay \$37,000 for a locomotive. The estimate was made before the war. The war came on and we were bound to get our machines as best we could.

MR. CARPENTER: Now, if we should rule out this testimony we would never have ascertained this fact.

MR. CROCKER: Well, if the Commission insists I am willing to go on. Mr. Judah's report was all guess-work. As I say, *his estimates were made before the war*. The war came on, and we built locomotives only to have the Government take them. Then we were obliged to build more at such prices as we were obliged to pay.

The foregoing extract is a report of Mr. Crocker's testimony taken from the San Francisco Bulletin. Mr. Judah's estimates were not made before the war, but during that time, in the year 1863. They may have been "*all guess-work*," but it is a little singular that the road should have been built upon his estimates and plans, as it undoubtedly was. From the same source and in the same connection I make the following extract from Mr. Crocker's testimony:

MR. CROCKER: Well, as to the cost of the road, I can only say that one mile might cost a million of dollars and another mile ten thousand dollars. The estimates or actual cost are averaged. If I testify here contrary to what our books show, of course I am wrong and will have to take it back. You can't expect a man to remember these things for twenty years.

MR. FOOT: Mr. Judah's report is familiar to you?

MR. CROCKER: It was at the time. I used to pore over it night and day.

MR. FOOT: The figures of the report were what induced you to go into the enterprise?

MR. CROCKER: Yes; that had its influence. We found, however, that Mr. Judah's estimate was wrong. That is, we found we could not build the road for what he estimated. Before the war we could buy iron for fifty-five dollars a ton; afterwards we paid ninety dollars for it. *I could build the road now for what he estimates.*

I recommend the italicized portion of the last answer to the careful consideration of my associates, who have all along acted upon the principle that *present value*, not *actual cost*, is the correct theory upon which regulation should be made and profits allowed.

Mr. Towne, in a written reply to certain questions, prepared by myself, and sent to him to be answered under oath, sent a communication to the Board, not verified, which gives the cost of the Central Pacific Railroad from Sacramento to Ogden, not including the leased lines. This is the first question and answer thereto:

First—What has been the total cost of your road and equipments to date?

Answer—The cost of the Central Pacific Railroad, including right of way, depots, buildings, wharves, docks, etc., to December 31, 1882, is \$138,553,459 29. The cost of equipment, including shops, machinery, real estate, river steamers, material, fuel, etc., is \$16,665,205 89. Of this amount there is over \$4,000,000 of material and fuel on hand, which is necessary on account of being so far removed from the base of supplies.

This answer furnishes the first positive statement of the actual cost of this road to the company. Even *one hundred and thirty-eight millions of dollars* is more than *three times* the amount estimated to be necessary by Mr. Judah, and I shall conclusively show, further along in this communication, that more than *one third* of this amount went into the pockets of individuals who contracted with themselves for the work, through the convenient device of the Contract and Finance Company.

ANOTHER ESTIMATE OF THE COST.

Mr. C. P. Huntington, one of the original incorporators of the Central Pacific Railroad Company, for a long time a well known resident of California, but recently a denizen of New York, manager of the company's affairs in the East and at Washington, and whose recently published correspondence throws some light upon the methods adopted to secure favorable legislation upon railroad matters, at one time gave an account of the financial status of the company and the funds it had obtained from various donations and grants. On the twelfth of May, 1874, Mr. C. P. Huntington addressed a communication to the Hon. Philetus Sawyer, the "Chairman of the House Committee on Pacific Railroads," which is now before me. The occasion for this address was a resolution of inquiry into the affairs of the Central Pacific Railroad, introduced by Hon. J. K. Luttrell, who was then a member of Congress from California, on the twelfth day of January, 1874. Mr. Luttrell's resolution had been referred to the committee of which Mr. Sawyer was Chairman. Mr. Huntington was desirous of repelling what he considered unjust imputations against the corporation which he represented, and, for this purpose, he wrote the pamphlet alluded to, which is bristling with facts and figures. That portion of Mr. Huntington's statement referring to the cost of the road, together with his remarks thereon, I give entire, for the purpose of comment and explanation:

VI. I commenced with the intention of showing the *facts* in regard to the items given in a summary on the first page of the resolution, as being the aid furnished to the company. This I believe I have done, and will not trouble you with further details, except to give a list of the bonds issued by and to the company, and by the Government, for the purpose of obtaining means towards the construction of the road, and I would respectfully ask your committee to compare the list given below with that given in the resolution, and to bear in mind that these bonds, with the stock, were all that the company had from which to raise money to apply to the construction and equipment of the road. They were used, as it was intended they should be used, to raise money with which to build the road, and they have been honestly and economically used.

Summary of the above items.

		Reduced to Gold.	Reduced to Gold.
Central Pacific Railroad Company of California, first mortgage	\$25,885,000 00	-----	\$18,625,499 75
U. S. Government Bonds to Central Pacific	25,885,120 00	-----	19,119,552 95
Central Pacific 7 per cent Bonds of 1883	1,483,000 00	-----	830,025 35
Central Pacific 7 per cent Bonds of '84, State aid	1,500,000 00	-----	978,584 68
Western Pacific Railroad Co., first mortgage	2,735,000 00	-----	1,975,814 39
U. S. Government Bonds to Western Pacific	1,970,560 00	-----	1,616,053 50
Central Pacific Railroad Co., Land Bonds (\$10,000,000)	9,153,000 00	-----	7,894,345 00
Net proceeds of land sales to January 1, 1874, in gold	613,675 69	-----	613,675 69
County Bonds, San Francisco, to Central Pacific	400,000 00	\$300,638 80	
County Bonds, Sacramento Co., to Central Pacific	300,000 00	192,129 55	
County Bonds, Placer Co., to Central Pacific	250,000 00	160,772 89	
			653,541 24
County Bonds, San Francisco, to Western Pacific	250,000 00	175,000 00	
County Bonds, San Joaquin, to Western Pacific	250,000 00	125,000 00	
County Bonds, Santa Clara, to Western Pacific	150,000 00	101,650 00	
			401,650 00
California and Oregon Bonds	6,000,000 00	-----	4,589,648 16
Central Pacific on California and Oregon Branch (\$7,200,000 authorized), sold	1,066,000 00	-----	802,457 20
Central Pacific on San Joaquin Branch	6,080,000 00	-----	4,686,590 83
San Francisco, Oakland, and Alameda	500,000 00	-----	425,000 00
	\$84,471,355 69		\$63,212,438 74

While the above gross sum of \$84,471,355 69, with the stock and certain earnings of the company, which went into construction account, constituted the actual cost of the road, it will be seen by the above summary of items that the company was subjected to heavy discounts in realizing its securities and converting them into gold during the war and soon after the war, when gold was high; and in addition, the company was subjected to heavy expenses for commissions and advertising, in realizing its securities.

Mr. Huntington's estimate of the cost in 1874 was widely different from that made by Mr. Towne to the Commission, and Mr. Crocker acted wisely in declining to swear to its truth, unless it corresponded with the books, the most important of which, relating to this subject, have been lost, or at least cannot be found. What was the amount of the "certain earnings of the company," referred to by Mr. Huntington, he does not explain. "The stock," however, can be traced and accounted for, and this brings me to the reference I desire to make to a corporation well known to the whole country as

THE CONTRACT AND FINANCE COMPANY.

This company was likewise a California corporation, a twin organization with the "Credit Mobilier," which contracted for and constructed the Union Pacific Road. The scandalous *exposé* years ago made concerning the methods pursued by these organizations at Washington, is familiar to almost every one, and need not be repeated here. In the same communication of Mr. Huntington, heretofore quoted from, he gives the following account of the Contract and Finance Company:

The work to the easterly line of the State was let to the firm of C. Crocker & Co. This plan worked much better, and the work progressed much more rapidly; but gold was at a high premium, and it became necessary to employ more capital in the work. The bonds and stock of the company, and the securities which it had at its disposal, could not be sold as fast as money was required for the prosecution of the work. Accordingly a contract was made with the Contract and Finance Company, a corporation organized under the laws of California, to complete the work. This contract, as well as that with C. Crocker & Co., was made at prices which were fair and reasonable for the railroad company, payable partly in gold coin and partly in stock. This company was able to obtain money on credit more advantageously than the railroad company, or the former contractors, could do. It imported a large number of laborers from China—some eight or ten thousand—and prosecuted the work much more rapidly and successfully than before, and more rapidly than it could have been prosecuted if the work had been let to small contractors. No sub-contracts were allowed or made.

Mr. Crocker's testimony, before this Board, was taken down in full by our Stenographer, and the notes were written up, and are now on file in the office. The books of C. Crocker & Co., which firm constructed the line from Sacramento to the State line, have, likewise, been lost. Upon that question Mr. Crocker testifies as follows:

Question—Do you know what the Central Pacific line cost per mile from Sacramento—I mean the average per mile from Sacramento to the State line, while under your supervision? Answer—I could not tell you now, sir; I don't remember. It cost a very large amount though.

Q. Have you any figures by which you could give us that information—any books? A. No, sir; I have not.

Q. Were there not books kept? A. Well, yes; I kept books—my accounts.

Q. Any of them in existence? A. I do not believe there are. I have not seen them for ten years.

Q. Do you know what has become of them? A. No, sir.

Q. And you cannot give us any information as to what became of them? A. I closed them up and I think they were put in boxes at Sacramento, and where they are now I could not tell you.

Q. Do you know if they are in—

WITNESS (interrupting)—They are closed up. I owed nobody and nobody owed me, and I did not consider them of any value.

Q. Well, then, is there any way, in your judgment, by which the original cost to you of the Central Pacific Railroad from Sacramento and within this State could be ascertained? A. I cannot, only to ascertain it in a general way.

Q. But there are no books in existence to your knowledge, now, by which these figures could be given, are there? A. No; none.

Q. And you have no knowledge of what has become of the books? A. No.

Q. They were rather voluminous, were they not—a good many books? A. Well, no; not very. I kept them in a very simple manner. I kept an account of what coin I received and what I paid out; that is about all. And about all I had left when I got through was the stock. The money was all spent that I received on the contract.

When the Contract and Finance Company was organized, Mr. Charles Crocker was and continued to the end to be its President. He was not at that time one of the Directors of the Central Pacific Company; he had been before, and subsequently became one. Neither Governor Stanford, Mr. Huntington, or Mr. Hopkins were nominally connected with the Contract and Finance Company, but they really controlled it, and had representatives in the Board.

The amount of Central Pacific Railroad stock paid to the Contract and Finance Company, for work done by that corporation, as stated in the evidence of Mr. Crocker, was \$58,000,000, in par value.

There was also paid in money by the Central Pacific Railroad Company to its corporation tender, the Contract and Finance Company, a large sum in cash, amounting in the aggregate to \$43,000 per mile of road constructed. Mr. Crocker in his evidence says that the stock payments were worthless at the time they were made, but by good management they have become valuable since that time. Purchases and sales have been made since at a sum per share greater than its par value, and at the time Mr. Crocker was giving his evidence, he stated it to be worth \$80 per share in the New York stock market. Mr. Crocker was doubtful as to what became of the Central Pacific stock paid to the Contract and Finance Company, for in answer to my question, he says:

Answer—I have no desire to conceal anything about it. The railroad company paid the Contract and Finance Company so much a mile for building the road, and the Contract and Finance Company spent all the money it got from the Central Pacific Railroad Company in building the road. They never derived a cent, a dollar of cash profits.

Question—Did the Contract and Finance Company receive other consideration from the Central Pacific Railroad Company, except the money they used, in the way of stock or bonds?

A. They received stock.

Q. Now, to whom was the stock given?

A. It was given to the Contract and Finance Company.

Q. Did any of it get into the hands of Governor Stanford, Mr. Huntington, or Mr. Hopkins?

A. I think so; yes, sir.

Mr. Crocker certainly knew at this time that he, as President of the Contract and Finance Company, had received his proportion of the stock earned, and he ought to have known that the representatives of his associates received and turned over to them their due proportion. Fortunately, however, the examination of other witnesses before the Board supplied the information.

Mr. Brown, the former Secretary of the Contract and Finance Company, Mr. Hopkins, the present Treasurer of the Central Pacific Railroad Company, and Mr. Douty, were all examined upon this subject. From their evidence it appears that certain dummy Directors of the Contract and Finance Company received the stock of the Central Pacific Railroad Company, and they immediately turned it over to Messrs. Stanford, Hopkins, and Huntington, who were its real owners. Mr. Crocker being a member, and President, of the Board,

received his own share. Thus, it appears that the money paid to the Contract and Finance Company, was all expended in payments made for the work, but that stock to the amount of \$58,000,000 was turned over to the Directors of the very corporation from which it had been received. This same stock is put in as a part of the cost of the road, and is the same stock upon which dividends have been declared and paid. It was never a legitimate item of the cost, in my judgment. The whole of this stock was earned for constructing some five hundred and fifty and two tenths miles from the State line to Promontory. How much of this stock C. Crocker & Co. received for work done in California, and whether they retained it all or divided with the other Directors of the Central Pacific, is not known. Mr. Crocker's books are lost, and he does not remember the cost. The Contract and Finance Company's books are likewise lost. Under these circumstances it is impossible to determine from documentary evidence what the actual cost of the Central Pacific Railroad was to the Contract and Finance Company. It is equally impossible to ascertain the fact from living witnesses, as they do not remember. By actual cost, I do not mean the money nominally expended upon it by the Central Pacific Railroad Company, for Mr. Towne gives us the figures to a cent, \$138,553,459 29.

What I do mean is what it really cost the Contract and Finance Company, for that was its true cost to the railroad company. During the whole of my examination of Mr. Crocker, answers to questions upon this subject (actual cost) were constantly evaded, and finally objections to them were sustained. My associates contend that actual cost to the company cuts no figure in the inquiry, if I understand their position.

This Board has no means of determining its present value—the criterion of the majority for purposes of regulation—except by its earning capacity. The effort to ascertain this fact from the railroad authorities has proven abortive. In order to get at this fact from the only available source at the command of the Board, I propounded certain inquiries to the General Manager at our first session. The fifth and sixth questions, as answered by Mr. Towne, are as follows:

Fifth—What is the total value of all your property in this State at this time?

Answer—*I am unable to give you the desired information.*

Sixth—What was the total amount of taxes assessed against the road in this State during the past fiscal year? Please state assessed valuation in each county of this State, and also whether the taxes assessed have been paid.

NOTE.—For answer please refer to annexed schedule, the aggregate of which is as follows:

Value of railroad.....	\$23,485,629 00
Value of other property.....	5,431,665 00
Total value.....	28,916,694 00
Taxes charged.....	475,653 41
Taxes paid.....	236,337 57

These figures are the aggregate of certain tables furnished by Mr. Towne, showing the assessed valuation and the amount of taxes assessed against and paid by the Central Pacific and "leased lines" in every county in California, and the tables need not be given here. Mr. Towne is the General Manager of the Central Pacific system of roads, including its leased lines, and the total length in California of these roads is two thousand and nineteen miles, nearly three times the mileage of the Central Pacific Railroad proper, the cost of which up to 1882, including equipment, according to Mr. Towne,

was more than \$154,000,000. Mr. Towne fails to give us the value of these two thousand and nineteen miles of road, but if his estimates concerning the Central Pacific are correct, it would be largely in excess of \$300,000,000. By reference to Mr. Towne's figures the assessed valuation of all the roads managed by him in this State, including railroad and other property, is only \$28,916,694, a sum ridiculously low, if the estimate of costs given be correct. It therefore becomes a pertinent inquiry, whether the cost has been purposely raised, or whether the value since completion has decreased, so that the property is now only worth *one tenth* of what it really cost.

I have always contended, and believe now, that the stock paid to the Contract and Finance Company and immediately returned to the pockets of the Directors of the Central Pacific, if even that formality was gone through with, was no part of the cost of the road, and that the patrons of it should not be taxed to pay dividends upon a fictitious valuation. *A trustee, using trust funds for his private gain and profiting thereby, is compelled by all rules of law and equity, when the fact is discovered, to account to his principal for the profits so made; to retain them being deemed fraudulent in law.* Individuals contracting with themselves, concerning a great public work, which the Government has fostered, protected, and furnished the money to build, are, or ought to be, upon the same footing. If regulation of these roads is legal and possible; if a fair profit on the investment is the criterion, on or one of the elements of regulation, why is it unjust for a Railroad Commission, charged with these duties, to refuse to allow profits upon stock which represents a double valuation, purposely made so as to increase the profits of those who control the roads, and who really issued it to themselves, in fraud of the rights of the people and the Government which created the corporation and endowed it with all its rights? Some of the stock has been legitimately disposed of and it is not now known how much still remains in the hands of those to whom it was originally paid. Some has been placed "where it would do the most good," but enough remains in the hands of the present Directors to enable them to keep the control of the companies. Most of these facts have been public property for years; none of them were known during the period when the railroad was in course of construction.

But to return to that time. Work upon the Central Pacific was vigorously pushed from the time of its commencement. Engineering difficulties of great magnitude were frequently encountered and overcome, and no one pretends to deny that those who conducted the enterprise are entitled to great credit for the energy and skill displayed in finishing the entire work several years before the time required by the Act of Congress.

The bonds were issued to the company in sums of from \$16,000 to \$48,000 per mile, as the work progressed. Eight miles eastwardly from Sacramento was established as the distance for which \$16,000 per mile was received; from that point to the State line, one hundred and fifty miles, the company received \$48,000 per mile, and from the State line to Promontory Point, in Utah, five hundred and fifty and two tenths miles, bonds to the amount of \$32,000 per mile were issued by the Government.

The connection with the Union Pacific Railroad was made on the tenth day of May, 1869. By some ingenious contrivance, the blow

from the silver hammer, which drove what was said to be a golden spike in the last rail, was communicated to the electric wires in the immediate neighborhood, and thus was the intelligence of the conclusion of the great work simultaneously flashed to every section of the country. Subsequent to this time the point of junction between the two roads was fixed at Ogden, in Utah, some fifty miles farther east, where it has since remained. It was given in evidence before our Board that the Central Pacific Railroad Company purchased this fifty miles from the Union Pacific Company, but I do not find the fact stated or the price paid in any of the reports.

The effect of the completion of the Pacific roads upon the commercial and business interests of San Francisco and the State of California at large, has been marked. Property is not so high now in San Francisco as it was when the roads were finished, and this may be truthfully said of every other business point then in existence in this State, with, perhaps, the exception of the City of Los Angeles, which has been particularly favored, of late years, by the managers of the Southern Pacific. The reason for this state of affairs is, of course, to be found in the fact that a large amount of the trade of adjacent States and Territories was secured by eastern manufacturers and merchants, who could then successfully compete with San Francisco merchants, by reason of railroad facilities furnished. I do not mean to intimate that railroads are not beneficial, or that I desire to return to the era of ox-team communication. I simply state the facts as they exist. The benefit of increased facilities for transportation no one will deny, and as the facilities increase and the volume of business likewise, "rates" and "rates of charge" should decrease. This is axiomatic, and generally acted upon, but not always. That the aggregation of large wealth, in the hands of the men who control great railroad corporations, is sometimes a detriment to the majority of the people, the recent history of our own State, and certain revelations lately made concerning political methods elsewhere, abundantly proves. But this is a question which I shall allude to again in this communication.

WHAT HAS BEEN DONE BY THE PRESENT BOARD.

I have, at the peril of extreme prolixity, dealt only with the affairs of the Central Pacific Railroad Company and its leased lines, because thus far, the Board has made no order and adopted no schedule applying to the lines of any other road in this State, and I shall now review that portion of the majority report which undertakes to deal with the actions of the Board, with reference to the various propositions regarding "fares and freights" which have either been voted down or adopted.

The constitutional provision under which this Board came into existence, is sufficiently broad for all purposes; the Act passed in 1880, in aid of the powers and duties with which it has been invested, can be amended with advantage in some particulars, but is comprehensive enough now to accomplish many practical actual results, in the matter of reductions of freight, and fares, which have thus far been defeated.

That this Board has some judicial powers I do not pretend to deny, but that it is purely a judicial tribunal, bound by the narrow and technical rules of construction usually applied in Courts of justice, I

do not think is susceptible of demonstration. It can investigate, it is true, but it can and should act, sometimes upon important matters even, in cases when all of the facts to make a complete case are not before it; as for instance, when a corporation either conceals or declines to furnish the information necessary upon which to base a perfect judgment.

In other words, even with every element necessary to be considered before it, the work of a Commission in fixing fares and freights in the first instance must necessarily be in a degree experimental, and the result will be less certain in the proportion that the facts are not known.

For this reason it is necessary to proceed somewhat cautiously at first. *I have never made a proposal for reductions upon the lines of the Central Pacific or its leased lines that I did not conscientiously believe, from the facts known to me, to be less than really ought to be made.*

AN ATTEMPT TO FIX FARES.

The first proposition to reduce fares was made in the present Board of Railroad Commissioners on the ninth day of January, 1883, by the introduction by myself, of the following resolution :

Resolved, That the Board of Railroad Commissioners of the State of California do hereby establish and adopt the following schedule of rates of charges for the transportation of passengers on the lines of railroad in this State owned, leased, controlled, or operated by the Central Pacific Railroad Company, or the Southern Pacific Railroad Company :

First—The rates for the transportation of passengers over the age of twelve years are hereby fixed and established at the sum of three cents a mile.

Second—The rates for the transportation of passengers over the age of five years and under twelve years are hereby fixed and established at the sum of one and one half cents a mile; *provided*, that when any of said railroad companies have, heretofore, by reason of competition, or for any other reason, reduced or fixed their rates for the transportation of passengers and their baggage, or for passengers only, at a sum equal to or less than the rates hereinbefore named, then in said cases said rates shall not be raised or increased.

This resolution was officially designated upon our minutes as Resolution No. 1. At the same time that it was introduced, I also offered the following questions to be answered, under oath, by the railroad authorities, and moved their adoption by the Board. These questions are officially known upon the minutes of our Board as Resolution No. 2, and are as follows :

First—What has been the total cost of your road and equipment to date? If any company owns, operates, or controls more than one line of road, please state the cost of each separate line?

Second—What were your gross earnings for the year 1882?

Third—What were your operating expenses for the year 1882?

Fourth—State the per cent of operating expenses as compared to gross earnings for each year since the road has been in operation?

Fifth—What is the total value of all your property in this State at this time?

Sixth—What was the total amount of taxes assessed against the road, in this State, during the past fiscal year? Please state assessed valuation in each county of this State, and, also, whether the taxes assessed have been paid?

Seventh—Please furnish a schedule of the rates of fare and freight charged by you in this State?

Eighth—How much of your gross earnings came from local passengers? How much from local freights?

Ninth—What were your total expenses for salaries to employes for the year 1882? Please state the names, official designations, and salaries of every person in your employment, in any capacity whatever, who receives as much or more than \$5,000 per annum.

Tenth—What amount of money do you pay as rent for each of your leased lines? Please state the rent per mile as well as the gross sum for each line.

The above resolution (Resolution No. 1) relating to the reduction of fares and establishing the *maximum* at *three* cents per mile, seems (from a reading of the majority report, but I did not observe it at the time) to have excited the ire of Commissioner Carpenter to an unusual degree. He attacks it with a vigor of language and display of rhetoric calculated to cloud the subject to which it relates in an impenetrable myth of technicalities. Mr. Carpenter speaks for himself only, I presume, when he says it was "introduced in advance of research;" he certainly does not speak for me, or correctly represent my views upon the subject. I distinctly stated, in open meeting of the Board, at the time this resolution was introduced, that I was *prepared to act then upon the subject to which the resolutions related from investigations already made*, but in deference to the apparent wishes of my associates, I consented to the postponement of a vote upon the resolutions until the other members could examine them and make up their minds what was the correct thing to do.

Mr. Carpenter said nothing about the legality of the resolutions at the time when they were introduced, for I had consented to their postponement, but in his majority report, referring to the one relating to a reduction of fares, he says it "has no reference whatever to the law, or the facts tested by the law, which prescribes *orders, decisions, and schedules*." A year's consideration of the subject has enabled Mr. Carpenter to pick flaws in a resolution which he was not at first prepared to combat. Further commenting upon this resolution, Mr. Carpenter, in his report, has this to say:

It is neither in form nor in substance what it purports to be, and is a mere nullity. Considered as a recommendation of arbitrary and uniform rates, not based upon any relation or proportion of the operating expenses and profits in passenger and freight departments of any road, nor upon the cost of any service in either of them, it was as easily postulated before as after the investigation.

This language seems to have been based upon the idea that the individual members of the Commission had made no investigation of the subject before taking the offices to which they had been elected.

So far as I am concerned, this was not true, and I had always supposed until now, that the other members of the Board had been equally diligent in ascertaining their duties. The platform upon which they, in common with myself, had been nominated and subsequently elected; upon which the contest had been conducted, and which each and every one of us had categorically indorsed, contains this language:

Resolved, That railroad fares and freights should be materially reduced; discriminations in favor of localities or persons should be prohibited, and we condemn the majority of the Railroad Commissioners of this State for their faithlessness in the discharge of their official duties. The nominees of the Democratic party will, if elected, carry out, in letter and spirit, the declarations of this resolution, and relieve the people to the extent of their jurisdiction from the exactions and injustice now practiced with impunity by the railroad company.

The gentlemen opposing the members of the present Board for the offices which the present Commissioners now hold, were nominated upon and pledged to support the principles of a platform, which, with reference to railroad affairs, reads as follows:

Seventh.—While we recognize the fact, that the building of railroads has proved one of the most potent agencies in the development and progress of the country, we at the same time remember that the great power which authorized such roads to be built, including the sovereign right of eminent domain, was granted to the railroad companies by the people, for the people,

and on the sole ground that the construction and working of railroads constitute a public use and such roads public highways. We declare that railroad companies, the same as individuals, should be dealt with in fairness and without injustice; but, by reason of their relation to the people, they must be kept subordinate to the interests of the people and within governmental control. The people should be protected by law from any abuse or unjust exactions. Unjust discriminations against individuals or localities should be prohibited. Equal service upon equal terms to all persons should be enforced. Charges for transporting persons and property should be limited to pay the legitimate expenses of operating such railroads, their maintenance in good repair, and a fair interest on their *actual value*. Such value shall bear the same relation to its assessed value, that the value of other property does to its assessed value. Charges in excess of this are in violation of the fundamental law of public use, which allows railroads to be built; and we hereby pledge our nominees for Railroad Commissioners to the enforcement of these principles by such a material and substantial reduction of the rates of fares and freights as will secure that result—the basis being cost of service, with reasonable allowance for interest and repairs as above indicated, instead of mercenary exaction of “*all the traffic will bear.*”

It will be seen from an examination of these two resolutions that the people of California, *irrespective of party*, had settled upon a policy regarding the regulation of railroad matters which was too plain to be mistaken. The party which was successful, and whose candidates were elected, had made a *plain specific demand* for a *material reduction*, and every candidate accepted the nomination with the distinct understanding that he would carry out the pledges so made. Mr. Carpenter, at least, knew what the obligations of the platform implied, for he had been a candidate for the same office before. I understood the obligations I assumed in accepting the nomination upon the platform, and if previous investigation had not fully satisfied me that I could carry out conscientiously the pledges it implied, I should not have been a candidate.

What is a *material reduction* is a matter upon which there may be an honest difference of opinion. I shall demonstrate before concluding that the reductions made by the schedules of the present Board, either in fares or freights, are in no fair sense “*material.*” The adjective “*material,*” as used in the sense of a “*material reduction,*” is thus defined in Webster’s Unabridged Dictionary:

MATERIAL. *a.* * * * 3. Of solid or weighty character; not insubstantial; of consequence, not to be dispensed with; *important*; momentous. “The discourse, which was always *material*, never trifling.”

And whilst I am upon this subject, I may as well say that my opinion now is, as it has always been, that the preparation of a “*schedule*” by the Board of Railroad Commissioners is not at all necessary to carry into effect any reduction that the Board should feel called upon to make. I cannot believe that the Legislature intended to cast upon this Board a duty which, if faithfully performed, would necessitate an amount of work which the effective force of this office would never be able to accomplish. I believe that a resolution fixing a maximum of rates of fares or freights, served upon the proper officers of the railroad companies, would be binding upon them, and that a failure to comply with it could be enforced through the “*medium of the Courts,*” as provided in the Constitution and laws of this State. It is useless, however, to split hairs or waste time in a discussion of this character, for it was avowed by myself, when this resolution was introduced, that if there was any question as to its legality I would prepare a schedule in conformity with it, within a week after its passage. Referring to the last question in the foregoing series (No. 9), its object was perfectly apparent, and I frankly stated it to be my intention to ascertain, if possible, whether this corpora-

tion had then, or if it ever had, political agents in this State, who were drawing salaries for services performed. The question was never answered satisfactorily, and before any answer was returned, the following protest was read to the Board by Colonel Creed Haymond, one of the attorneys for the Central Pacific Railroad Company:

SECRET SERVICE.

Passing from this section, and referring a moment to the second resolution to which your honorable Board has called the attention of the company, we have a single suggestion in relation to the ninth question of that resolution. Part of it calls for a statement of the names, official designation, and salaries of every person in the employment of the company who receives as much as or more than \$5,000 per annum. The suggestion which we desire to make in this connection is, that while it may be entirely proper for your Board to know the amount of salaries paid to every class of employes, from the President down, yet it may be an invasion of a private right to ask the name of any employé not directly connected with the executive department of the company: that, as between the company and such persons the question of salaries is a private one. This is the only objection we would urge against the second resolution, for when the salaries paid to each class of employes are laid before your honorable Board you will find that to the President and Directors of the various companies belonging to the Central Pacific Railroad system are paid the lowest salaries known to railroad service, while to subordinate and skilled mechanics, and down to the humblest laborer, there is given the largest compensation known to such service.

I beg leave to differ with Colonel Haymond as to that portion of his protest which says that the highest salaries known to the service are paid to "skilled laborers and subordinates." It is undoubtedly true that skilled and ordinary labor commands as high prices in California as it does in any other settled community in the United States. But this is not due to the advent of the railroad company. I am informed by employes of the road that the wages of many of the employes have recently been reduced, and "station agents" at some of the important stations on the line of the Southern Pacific Road are only paid \$65 per month, and are expected to do the commercial telegraph business without extra compensation.

The resolution reducing fares was not pushed to a vote at the first meeting of the Board, but the questions were sent to the railroad authorities. On the fifth day of February, 1883, at a meeting of the Board, Commissioner Carpenter drew from his pocket and introduced for adoption by the Board, a so called Substitute for my three-cent resolution and questions. I had never seen or heard of it before it was presented. It was as follows:

BOARD OF RAILROAD COMMISSIONERS OF THE STATE OF CALIFORNIA.

In the matter of Resolutions Nos. 2 and 3, introduced by W. W. Foote, and now pending before said Commissioners: The investigations commenced by said resolutions, and now on this day resumed by said Commissioners upon their own motion, without petition, complaint, or any evidence of record herein, and it appearing that said Resolution No. 2 is by its terms confined to rates of charges for the transportation of passengers on the lines of railroad in this State owned, leased, controlled, or operated by the Central Pacific Railroad Company, or the Southern Pacific Railroad Company; and it appearing to said Commissioners that this investigation, and the evidence taken therein, should relate to the general subject of fares and freights, and furnish a basis and a reason for the revision and reduction of both, upon any or all the railroads or transportation companies in this State; and it appearing that for such purpose the scope and requirement of said Resolution No. 3 should be so enlarged and outlined that the power conferred by the Constitution and laws shall be duly and regularly exercised as therein prescribed. Now, therefore, as a substitute for said resolutions, it is ordered by said Board of Commissioners:

First—That they will proceed in accordance with the following provision of the Constitution: To establish rates of charges for the transportation of passengers and freight by railroad or other transportation companies, and publish the same from time to time, with such changes as they may make; to examine the books, records, and papers of all railroad and other transportation companies, and for this purpose to issue subpoenas and all other necessary process.

Second—Having taken, examined, and considered the documentary and other evidence necessary to an intelligent and equitable revision and reduction of charges for fares and freights

by railroads or other transportation companies of this State, they will prepare, and as required by the Statutes of 1880, Chapter LIX, Section 11, serve a printed schedule of such rates and of any changes which may be made in such rates, upon the person, copartnership, company, or corporation affected thereby.

Third—To accomplish the practical purposes aforesaid with becoming order and dispatch, only such testimony, exhibit, or report shall be deemed relevant or material as tends, subject to the following rules and principles, to show: First, the corporate name and principal place of business of any transportation company mentioned in Section 14, Chapter LIX, Statutes of 1880. Second, the names, places of residence, and compensation of all officers and agents employed by or on behalf of such company in the business of transportation, or in operating any railroad of such company; the length and termini, character and equipments, stations and terminal facilities, capacity for freight and passenger service, rates of charges, through, local, and special; resources and financial condition, and general business of any such railroad, and feeder and branches.

Fourth—The present and prospective value of any such road, feeders, or branch, as a source of income and a means of earning it, to be estimated and determined as if for any other purpose; the cost of construction to be taken and considered as an element, but not as a conclusive criterion of value.

Fifth—What should be deemed a reasonable profit on such value, and what rates of charges for fares and freights on such road, branch, or feeder will pay the company owning and operating the same, cost and risk of service, interest on its bonded and floating debts, the sum of taxes paid, and such reasonable profit as aforesaid.

Sixth—The fair apportionment of such rates as aforesaid, with due regard to the relative cost of service and such regulations as are usual and proper for railroad companies, to the passenger and freight departments respectively.

Seventh—The repairs and renewals, betterments and extensions in the State necessary to the safety, public use, or successful operation of any such road, feeder, or branch, and the nature, extent, probable cost, and subsidiary interest of all concerned therein.

Eighth—The rates of charges for all classes of fares and freights established, exacted, or received by any transportation company in this State under special contracts, private instructions, or published schedules, and the reasons, rules, regulations, and classifications by which they are all severally governed and enforced.

Ninth—It is ordered that an attested copy of the following Circular Letter No. 2, be forwarded by mail to the President, Secretary, or General Superintendent of each railroad company in this State.

This was followed by a number of questions to be propounded to Mr. Towne (including those which I had previously asked), and to which I made no objection.

The substitute proposed an investigation before action, and as was stated by myself in my remarks made in opposing its adoption, it would delay action for months. It was adopted, however, by the votes of Messrs. Humphreys and Carpenter, against my earnest, but ineffectual, protest. Having become an order of the Board it has since been acted upon. All the investigations subsequently made by myself have only confirmed previous impressions as to the necessity for an immediate and substantial reduction, and the delays predicted have occurred. Mr. Carpenter's resolution having passed, and the whole people being clamorous for the reforms which had been promised, and the Board having officially announced, through the adoption of Mr. Carpenter's substitute, that it would not act preceding investigation, I at once proceeded to make whatever investigation was possible, to the end that some needed reductions might be made. To this end quite a number of witnesses were called, for the purpose of finding out the necessary facts. I believe that every witness called, including Mr. Charles Crocker, Mr. Brown, Mr. Douty, and a number of others, were brought before this Board at my individual suggestion. In addition to witnesses orally examined, the Board received from the various heads of the departments of the railroad company, a perfect flood of documents, of various degrees of merit, good, bad, and indifferent. Neither the examination of witnesses, or the attentive perusal of communications, enabled me to form a more definite judgment upon the questions before us, than prior reading and inves-

tigations had created. Many of the facts designed to be elicited had not been furnished, and the principle upon which I thought regulations ought to be based, had been ignored by a majority of the Board. Under these circumstances I proposed to my associates that the Board should take a trip through the country, to ascertain from the producing classes what were the special grievances of which they complained. It was our *first* trip, and thus far, has been our *last*.

The investigation was commenced at Colton, and continued at several important points on the line of the Southern Pacific Road, from that point northward to the City of Stockton. More than a hundred people came before the Board at the various meetings held, and the information elicited was, in many instances, valuable. The majority report deals very lightly with an account of this trip. We were whirled over the country in regal style, and given every opportunity for investigation at every point where meetings had been advertised to be held. At several places no complaints were made. Colton, in the County of San Bernardino, was the first place at which a meeting was held. At this point there were no complaints, but not because there were no causes of grievance. Our predecessors in office had visited this place and received a number of complaints, which were referred to the officers of the railroad company, and never afterwards heard of. As all these meetings were held in counties composing the district which I have the honor to represent upon the present Board, and as I am personally acquainted with most of the people living in the localities visited, it was not, perhaps, strange that I was more freely consulted than were my associates. At Colton, as well as other points on the route, I was frequently told that former complaints had not been rectified, and that no great degree of confidence was felt in the present Board. This was a subject of regret to me, and I honestly labored to dispel the impression, and induce parties having grievances to lay them before the Board. In most cases my efforts in this direction were futile. Our meetings at Visalia, Bakersfield, Hanford, and Modesto, were well attended, and at the two last named places, were particularly lively. At Hanford, our meeting was largely attended, and those coming before us indulged in criticisms of the Board, and its failure to act, which were decidedly to the point. At this point (Hanford, Tulare County), and at Modesto, each one of the Commissioners was called upon for an expression of views, which was given, and the feeling was more friendly after than before these speeches. Hanford is about the only place visited, at which we did not remain over night. At Los Angeles there were no complaints, to be accounted for by the fact that Los Angeles is classed as a "competitive point," and, for a number of years has enjoyed unusual favors at the hands of the railroad company. In another connection I shall have a word to say about "competition," and "competitive points."

At every point we visited, I mingled with and talked freely with the citizens about their grievances, real or supposed, and at all times urged upon them the importance of coming before the Board and making known their complaints. At every place visited there was exhibited the same distrust of the Commission, and apprehension of retaliatory measures upon the part of the railroad company, if complaints should be made. Mr. Gray, the General Freight Agent of the railroad, and his assistant, Mr. Smur, who, upon our invitation accompanied us, and to whose courtesy and kindness I feel myself much indebted, sometimes joined with me in urging parties to appear before us, assuring

them that the fact would not be used against them in any way whatever by the railroad authorities.

Notwithstanding these solicitations, I am sorry to say, the trip was not fraught with the good results I had hoped and expected, and I am satisfied that, for the reasons given, many valuable facts were not given to the Board, which were communicated to me individually. I regret that this should have been so, and sought to have it otherwise, but I am simply stating the facts as they exist. After a pleasant, but rather unprofitable journey, so far as the acquisition of useful knowledge was concerned, the Board returned to San Francisco and resumed its sessions in this city.

Among the first business transacted after our return to San Francisco was the decision of the case of Richards & Harrison against the Central Pacific Railroad Company. This involved the validity of what is known as

THE SPECIAL CONTRACT SYSTEM.

For several years past many of the merchants of San Francisco and other places, classed as "competitive points," have shipped their west-bound freight under what is known as "special contracts." This subject has been, perhaps, as thoroughly discussed through the newspapers as any other matter relating to railroad affairs in California. Mr. John T. Doyle devoted much time and considerable space, to an elucidation of the supposed mysteries of the system, immediately preceding the late election. Each one of the present Commissioners had something to say upon the subject in published communications prior to the election, notwithstanding there was some complaint made about the impropriety of "judicial officers" expressing unasked opinions upon questions which might come before them for official action.

The report of my associates only contains a brief reference to this subject other than the published opinions in the case of Richards & Harrison vs. The Central Pacific Railroad Company.

In order that this whole subject may be thoroughly understood I shall here undertake to supply what I conceive to be the omissions, doubtless unintentional, of the majority report. In a published communication to his constituents, dated the thirty-first day of July, A. D. 1882, Commissioner Humphreys uses this language concerning the special contract system: "I am decidedly in favor of the speedy and total abolishment of every species of discrimination, whether as to persons or places, the discontinuance of the contract system, in its arbitrary application to individuals and sections, and the absolute removal of all those grievances against which the people now complain."

Commissioner Carpenter, in a letter to the Daily Examiner, published on the third day of October, A. D. 1882, and widely circulated as a campaign document, expressed his views upon the same subject as follows: "Third, Compulsory and other private contracts between railroad companies and merchants, or other patrons, in consideration of such advantage to either or both of the parties as works an injury to others, or in restraint of transportation by sea, or of free exchange or sale of commodities among merchants, are clearly repugnant to the law governing the public use of railroads, and should be unconditionally annulled and prohibited."

At a much earlier date, namely, on the seventeenth day of July, A. D. 1882, I gave my own ideas upon this question, through the same medium employed by Mr. Carpenter, as follows: "The contract system enforced upon the merchants of San Francisco, by means of which they are forced to pay double prices unless they ship all their goods by rail, partakes more of the nature of a crime than a mere breach of duty; and I have no doubt will be so declared by the next Legislature."

My opinion, thus expressed, was given after as full an investigation of the question as was possible, as, I presume, likewise, were the opinions of the other Commissioners. My own views, after the trial of the case of Richards & Harrison, were neither altered or modified, but were strengthened, by the testimony offered in that proceeding.

On the sixth day of February, A. D. 1883, Mr. Harrison, of the above named firm, presented a written verified complaint to the Board, alleging, among other things, that his firm had been discriminated against, to its detriment, in the matter of "special contracts." Mr. Harrison appeared in person as the representative of his firm. Summons was issued upon his complaint and duly served upon the Railroad Company's General Manager, and in due time the defendant appeared by its attorney, General Barnes.

General Barnes filed special objections to the complaint, in the nature of a general demurrer, which, for the purposes of the argument afterwards had, admitted the truth of the facts alleged. General Barnes argued his demurrer or motion to dismiss. Mr. Harrison replied, and the matter was submitted to the Board for its decision. I was selected to write the opinion, which I did, and it was concurred in by my associates.

And, inasmuch as it was omitted from the majority report, I insert it here:

BOARD OF RAILROAD COMMISSIONERS OF CALIFORNIA.

Richards & Harrison vs. The Central Pacific Railroad Company.

The question for decision in this case, as it now stands, arises upon the complaint of the plaintiff and certain general and specific objections filed by defendant's attorney in the nature of a special demurrer to the complaint.

The complaint in this case, tested by the liberal rules of pleading prescribed by the Code of Civil Procedure even, is certainly fatally defective. And this statement at once raises the question as to what rules should and ought to govern the Board in matters of this nature.

The Board of Railroad Commissioners, although having certain judicial functions, is not a Court in the sense that proceedings before it are to be governed by the same technical rules which prevail in ordinary Courts of justice, and this was expressly admitted by the attorney for the defendant in his oral argument before the Board.

One of the objects sought to be accomplished by the framers of our present Constitution, and by the people who voted for and adopted that instrument, was to create a tribunal where complaints of this character could be speedily heard and fairly determined, without resort to the artificial modes of drawing pleadings and obtaining evidence which prevailed with reference to such matters prior to the adoption of that instrument.

To require complaints, therefore, before this Board, to be tested by the same rigid standard which obtains in our civil Courts, would be in effect to say that every complainant should be required to employ persons skilled in the law before he could be heard in this Board, which would in practice be to defeat one of the primary objects for which the Board was created.

So far as the complaint undertakes to present the grievances of persons other than the firm of Richards & Harrison, it cannot be considered by the Board, nor can any evidence be received with reference to these grievances in this proceeding. The complaint of Harrison does state, however, that the firm of Richards & Harrison have been compelled to pay higher freight rates than other individuals and firms in the City of San Francisco upon the same classes of goods and for the same distances carried, and the reasons for this alleged discrimination are also given in the complaint. This much can be understood from a fair consideration of that portion of the complaint relating to the discriminations alleged against that firm.

If this be so, there is one good cause of action stated in the complaint, which the defendant should be required to answer.

The only statutory provision upon the subject of pleadings before this Board is to be found in Section 10 of an Act of the Legislature, approved April 15, 1880, and is as follows:

"All complaints before said Board shall be in writing and under oath."

Counsel for defendant, however, strenuously insists that the rules adopted for the government of the former Board control the present one, and that tested by these rules, the complaint is fatally defective.

Without discussing the question fully, it is sufficient to say that the rules can and will be liberally construed in the interests of substantial justice, and without regard to legal technicalities.

Had the framers of the Constitution, or the Legislature which put this Board into operation, have intended to make it purely a judicial tribunal, they would have said so, and they have not, but on the contrary, for any citizen is eligible for this office, whether he be lawyer or layman. The language of this complaint might be strengthened by being moderated.

For the reasons stated, the defendant's objections to plaintiffs' complaint are overruled, and it is required to answer that portion of the complaint relating to alleged discriminations against the firm of Richards & Harrison. The other portions of the complaint can be stricken out, or will be treated as surplusage.

W. W. FOOTE,
Commissioner from Third District.

WM. P. HUMPHREYS,
Commissioner from Second District.

G. J. CARPENTER,
Commissioner from First District.

In accordance with the intimations of this opinion, certain irrelevant sections of the complaint were stricken out, and to the complaint so reconstructed, the railroad company filed a verified answer, and the case was then placed upon our calendar for a trial upon the merits. The trial was had in due time. Mr. Stubbs, General Traffic Manager of the Central Pacific Railroad Company, Mr. Gray, General Freight Agent, and one or two merchants, were called, upon behalf of plaintiffs, and examined. Quite a large number of documents were introduced in evidence, among them one of the blank forms of the special contracts. The evidence is contained in a printed pamphlet of about one hundred pages, and is one of the records of the Board. This case was argued both for the plaintiffs and defendant, and finally submitted. The majority opinion, written by Commissioner Carpenter, and specially concurred in by Commissioner Humphreys, together with the dissenting opinion filed and read at the same time by myself, are printed in the majority report, and it is useless to repeat them here.

A special opinion was filed by Commissioner Humphreys, which does not appear in the majority report.

In order that the whole subject may be understood, that Mr. Humphreys' individual views *then* may be known, and that a valuable document may be preserved in a more enduring form than as a manuscript record in an insignificant pigeon hole, as well as for the reason that I have some comments to make upon this opinion, I insert it here:

BOARD OF RAILROAD COMMISSIONERS OF THE STATE OF CALIFORNIA, }
SAN FRANCISCO, JUNE 6. }

Richards & Harrison, Plaintiffs, vs. The Central Pacific Railroad Company, Defendant.

I find myself in a position of some difficulty in deciding what ought to be done in this case. My associates are both accustomed to the determination of legal questions and the examination of disputed facts. They disagree in this case on both propositions, and it is left to me to follow either. I should agree with my associate, Mr. Foote, if I could, because I have the same feeling in relation to the special contract system that I have always had. I was surprised and disappointed that, notwithstanding the publicity given the proceedings and the liberality of the Commission as regards evidence, we had practically no evidence before us of the operation of the special contract system, except that given by the General Freight Agent of the railroad company, and no merchant or importer testified before us to any fact whatever.

Mr. Harrison, the complainant, was not even a witness in his own behalf, and did not give us the benefit of his knowledge of the matter. It strikes me that there should have been more of an effort made to exhibit the working of this special contract system than complainants have

made. The most I can make from the facts proven, is that there are two sets of rates on bottled beer shipped by Shafe & Co. of Milwaukee—one called the "Open Tariff Rates," and the other "Special Contract Rates," and that the shippers have preferred the "open rates" to the "special contract rates."

The only transaction brought directly to our notice by complainant, was a shipment made at Milwaukee by this firm, under a bill of lading issued in Milwaukee by a railroad with which we can have nothing to do, and where their rate was fixed by that railroad and not by any railroad within our jurisdiction. Letters have been before us written by Richards & Harrison to the Freight Agent of the Central Pacific Railroad Company, complaining of overcharges on various shipments, and Mr. Dempster and Mr. Bach have stated, under oath, that one had no contract because he declined it, and the other had one because he accepted it when offered. If other evidence of what I have always been led to believe was the working of the special contract system exists, it was not produced before us, and I take it that in a case of this nature we are to decide upon the evidence presented, and not according to previous impressions, however correct they may have been, or however much in accord with popular ideas.

I have read the opinions of my associates with all possible attention. It seems to me that a contract made by the merchants of San Francisco, or of the Pacific Coast, with the Union Pacific Railroad Company, and the Iowa lines and great trunk lines between New York and Chicago, with their numerous connections, whatever its terms, must necessarily be beyond the jurisdiction of this Board, and the fact that the Central Pacific Railroad Company receives, out of the prices on through freight by rail, fixed by this contract, larger or smaller proportions of these prices, for the proportion of the carrying done by it, does not make this last company a party to the contract, so as to enable us to deal with the contract as such and declare it to be valid or the reverse. This seems to me to be common sense.

Therefore, I am constrained to say that from the meager evidence brought before us as to the effect of the special contract, the blank form of which has been exhibited to us, and the entire failure of any proof of practical hardship to our merchants as a class, or to the complainants themselves, or of any espionage or interference with the business of the city, and particularly because I cannot see how we can handle or set aside contracts of the nature of the only one exhibited to us in a blank form, or take jurisdiction of them, or prevent them from being made and enforced by the contracting parties, I concur in the conclusions arrived at by Mr. Carpenter, in his opinion, and shall vote for the order which he thinks should be made in the case.

WM. P. HUMPHREYS,
Railroad Commissioner Second District.

This opinion, in my judgment, proceeds upon a mistaken view of the facts indubitably established in the case. It was certainly proved that Richards & Harrison were the consignees of the goods and paid the freight on the same. It was likewise proved and clearly established that this firm were charged fifty dollars per carload more for their goods than other shippers who received their goods under "special contract" rates. Mr. Stubbs and Mr. Gray both so testified, and they likewise admitted, under oath, that the Central Pacific Railroad Company received eighteen dollars of the fifty dollars overcharge, as its proportion of the freight money. It is true that the Central Pacific Railroad Company was not nominally a party to these contracts, but Mr. Stubbs admitted that his company was interested in them to the extent of the freight earnings received under them, and General Barnes fully conceded the facts that the Central Pacific Railroad Company were real parties. On page 36 of his printed brief, on file in this office, he makes the following concession, and every lawyer knows that a fact admitted by counsel supersedes the necessity for proof:

It is in evidence, and admitted for that matter, that the Central Pacific Railroad Company, though not a nominal party to these contracts, has acquiesced in them, approved of them, had a voice in the original determination of the rates, has made suggestions as to their modification, and is interested in the results of the contracts to the extent of its proportion of the moneys agreed to be paid under them.

Upon the same page of his printed brief General Barnes also admits the jurisdiction of the Board in the following terms:

It may well enough be conceded that until the State of Nevada, and the Territory of Utah, shall adopt some law for the control of freights and fares, and for the general regulation upon

this subject of all railroads within their respective borders, the judgment or order of this Board of Railroad Commissioners may control the action of this California corporation in respect to freights and fares, with the details akin thereto, on its line without as well as within this State.

The majority opinion in the Harrison case cites the fact that the mercantile community of San Francisco have made no complaint concerning the operation of the "special contract system." It is true that no other merchants, save Richards & Harrison, have made formal complaints to the Board. Referring to this subject, in the latter part of his report, Mr. Carpenter uses this language:

Since the ninth day of January, A. D. 1883, this Commission has been in session next door to the importing firms of San Francisco, all but one of which has entered into so called "special contracts" with the Union Pacific and other eastern railroads for the transportation of west-bound through freights, all rail, a fact that may account for the apparent satisfaction of the contracting parties with the contracting eastern carriers. The Central Pacific Railroad Company *prorates* on all through traffic. The contracts are executory, and contain a clause in restraint of patronage to ocean carriers on such freight, coupled with penalties for its violation, and some other provisions which might, in a proper case, be held to be void. Every one of them is a contract between citizens of this State and other States, from beginning to end. Judging from the blank form, which is all that has ever been exhibited to the Commissioners, they relate to inter-State commerce. In a suit, therefore, to enforce or rescind one of these contracts, or to annul the clauses referred to, the parties would find themselves in the Federal Courts; but the purpose of this reference is not to indicate a remedy for the alleged wrongs of the contracting firms, all of which are presumed to know their rights, and to have none which they dare not maintain.

The statements made in this extract do not recite the facts concerning special contracts as they were proved in the Richards & Harrison case. They are not, "from beginning to end," as alleged, contracts "between citizens of this State and other States." As heretofore shown by the testimony of railroad employes called and examined by the plaintiffs, as well as by the express admissions of counsel for the companies, these contracts, so far as the freight earned under them by the Central Pacific Railroad Company is concerned, are contracts between citizens of California and a California corporation. In the minority opinion, filed in this case by myself, the following language with reference to these contracts is used, and it correctly states the facts with reference to certain clauses contained in them:

In the first place, a shipper who signs one of these contracts must agree to ship all his freight by rail. A failure to do so forfeits the privileges of the contract and obliges him to pay open tariff rates.

Secondly—No one who has a special contract can buy from or sell to any one who ships in any other way than by rail, under the same penalties.

Thirdly—The railroad company reserves the right to examine the books of shippers in order to determine whether the terms of the contract are being faithfully complied with.

A contract containing such provisions as these, in my judgment, offers a premium for fraud; it gives the dishonest shipper an undue advantage over one who will carry out the terms of the contract; its enforcement is against public policy and in restraint of trade. It establishes a system of espionage over the mercantile community which no common carrier ought to be allowed to exercise under any circumstances.

Entertaining these views, I think a decree should be made declaring that Richards & Harrison are entitled to recover from the Central Pacific Railroad Company all freight moneys which they have paid to the defendant in excess of the "special contract" rates, and that such order or decree could be enforced under Section 22 of Article XII of the Constitution, which gives to the Commissioners power to enforce their decisions and correct abuses through the medium of the Courts. Under the same statutory and constitutional provisions, it seems that we have the power, and it is our duty, to make and serve upon the Central Pacific Railroad Company a general order, requiring that corporation to refrain from entering into further contracts, and to carry for all shippers alike, at the lowest rates which are now charged to the most favored customers. This order could certainly be enforced under that further provision of Section 22, Article XII, of the Constitution, which provides a fine of \$20,000 for failure to conform to such rates as may be established by this Commission.

For the reasons herein stated, I dissent from the views expressed by my associates.

W. W. FOOTE,
Commissioner Third District.

I do not pretend to know what may have been the experience of the other Commissioners, but I can state what has been my own. I have conversed freely with many of the leading merchants of San Francisco, some of whom have signed "special contracts," and others who were conducting business under "open tariff" rates. The universal opinion expressed, was that they were unjust, and a serious detriment to the commercial prosperity of San Francisco. Those who have signed these contracts did so as a measure of self-protection, as they could not otherwise compete successfully with dealers in the same line without them. Those who have not signed them were compelled to make some of their shipments by the Isthmus route, or around Cape Horn, and such traffic is specially interdicted by the terms of the contract itself.

It may seem strange that complaints have not been made, for I have frequently importuned merchants to come forward, or at least allow me to use their names, but have uniformly met with a refusal. The reasons for such action I dislike to state, but they have always been the same. They did not believe the Commission would redress their grievances, or were fearful that they would incur the enmity of the railroad company. I fully concur with Commissioner Carpenter as to the manliness of the mercantile community of San Francisco, and their general readiness to maintain their rights, yet knowing, as I do, the ability of the railroad company to make or mar the fortunes of a merchant, I do not consider it an evidence of puerility to refuse to engage in an individual controversy with a rich and powerful transportation company. The fact is that the Central Pacific Railroad Company, under existing conditions, without competing eastern lines west of Utah, and almost absolutely controlling local traffic within this State, is too powerful an organization to be successfully resisted by any individual or firm. It is the part of wisdom, and evinces no want of courage, to "rather bear the ills they have, than to fly to others that they know not of," yet of which they have the most lively apprehension. Combined action, which will some day be taken, will produce the results desired.

ADDITIONAL PROCEEDINGS OF THE BOARD.

The night before our meeting in the City of Stockton, all three of the Commissioners were "interviewed" by the local reporters of that city, and each expressed his views upon the questions of "*regulation*," and "*proposed reductions*," subsequently to be made by the Board. I then announced my intention of offering certain resolutions upon my return to San Francisco. Several days thereafter a regular meeting was called by the President of the Board, and at that meeting the following resolution was introduced by myself:

OFFICE OF BOARD OF RAILROAD COMMISSIONERS, STATE OF CALIFORNIA.

WHEREAS, The present Board of Railroad Commissioners have now been in office for nearly five months, and during said time have made no regulation reducing either freights or fares, or for the prevention of extortions or discriminations upon the part of any of the transportation companies of this State; and whereas, on the fifth day of February, A. D. 1883, a substitute for Resolutions Nos. 2 and 3 was passed by a majority of this Board, the purport of which substitute was that investigation should precede action by this Board; and whereas, this Board has now investigated the subject of fares and freights upon certain lines of railroad in this State, the result of which investigation has been to demonstrate that fares and freights upon said roads are too high, and that discriminations and extortions have been and are now being practiced which are prohibited by the Constitution, and should no longer be tolerated; therefore, be it resolved:

First—That the judgment of this Board is that upon the Central and Southern Pacific Railroads and their leased lines the maximum rate for passenger fares should not in any case exceed the sum of three cents per mile, and where said rates are now equal to or less than said sum per mile they should remain as they now are.

Second—That the freight charges upon said lines of railroad above named should be reduced at least twenty per cent from the freight rates in force on said roads on the first day of January, A. D. 1883.

Third—That all discriminations which are now practiced ought at once to be forbidden.

Fourth—That this Board proceed immediately to revise the tariff of freights and fares upon the said lines of road, and serve copies of such revised schedules upon the corporations affected thereby, so that all of said contemplated reductions may go into operation on or before the first day of July, 1883.

This resolution met with an expected and an ignominious fate. It was tabled at the time it was offered, by the votes of Commissioners Carpenter and Humphreys. I, of course, voted for its adoption. Before this action of the Board, quite a lengthy argument was had upon the subject between Commissioner Carpenter and myself. A careful reading of this resolution will disclose the fact that it was drawn with a view to obviate the objections raised so often against "resolutions," as contradistinguished from "schedules." Its design was merely to get an expression of the collective opinion of the members of the Board, as to the propriety of reductions to the amount named in the resolutions. Upon this resolution and its fate, Mr. Carpenter, in his report, is prodigal in the use of his choicest rhetoric for its condemnation. The *whereases* with which it is prefaced certainly do "import" the reasons for its introduction, but the President of this Commission well knows that the language of this resolution was not used "in a tone of self-reproach," for he is well aware of the fact that I have always been willing, *anxious*, and *persistent* in my desire to redeem the promises made for substantial reductions, *given before the election*, and only made after a *full examination of the facts*. I shall not attempt to follow or answer Mr. Carpenter's denunciations of this resolution. It was introduced in entire good faith, to ascertain the views of the Board, and it accomplished its purpose, but not as I had hoped or desired. Its rejection demonstrated to me that my fellow Commissioners and myself were not in accord upon the subject of our duties, and reluctantly convinced me that my ideas would not be adopted or favorably considered by the majority of the Board, and that any reductions which would be made, would be long delayed, and by no means adequate.

The passage of this resolution, or any like it, was vigorously resisted by the railroad companies who were to be affected by its provisions, a proof to my mind that the railroad corporations entertain the opinion that reductions can be accomplished in this way, as well as by "schedules."

MR. HUMPHREYS (?) ON PASSENGER FARES.

After the defeat of this resolution, Mr. Andrus, and his assistant at the time, the son of Commissioner Carpenter, prepared for Mr. Humphreys a "schedule" of fares upon a basis of five and seven cents per mile. This schedule was offered for consideration and amendment. It was incomplete in almost every particular—left out several hundred miles of road, and was not in the form of the one subsequently adopted by the Board. During its preparation it was several times thrown in the waste basket, but was finally rescued, offered, and withdrawn, and is now on file in our office, by my direc-

tion. This schedule was the one for which I offered my original "three-cent schedule" as a substitute, which was also withdrawn at the same time Mr. Humphreys' was. Mr. Carpenter, commenting on Mr. Humphreys' first schedule, has this to say with reference to the first schedule introduced by myself:

Thereafter, on the eleventh day of June, Commissioner Foote introduced a *defective substitute* [the italics are my own], showing the distance between stations, and the price of a ticket from any given station to the next, but leaving it to any more distant point to be ascertained by computation upon the uniform basis of three cents a mile. It was not, therefore, in the established and convenient form which shows naturally the rate multiplied by the distance from one station to the next, to the end of the line, but from each to all, and from all to each over the entire road. But for the purpose of a vote upon the unreasonable uniform maximum rate, three cents per mile, over all the roads, without regard to cost or conditions of service, it was treated as a schedule.

The intimations contained in this language I feel called upon to notice. The schedule prepared by myself was "not defective" in any particular, and it contained but one mistake in figures, a mere error in calculation, which was subsequently corrected by myself, it having been discovered by the Secretary, who has carefully gone over the schedule with me, although the clerical work had been done under my direction and in my private office. Both these schedules are on file in our office. They are too long for publication here, but I cheerfully invite a comparison between them by any one who feels an interest in the subject.

The "usual and convenient form," referred to by Mr. Carpenter, when commenting upon the schedule introduced by Mr. Humphreys, is the form used in preparing documents of this kind by nearly all railroad companies for the information of their employes. Schedules so prepared are unintelligible to any outsiders without an explanation. Only a few days since, at one of the small stations on the road, I examined one of the schedules adopted by the Board, and posted by the railroad company. The gentlemanly agent was enabled, after some little time, to give me the rates from Red Bluff to Los Angeles; but, in our conversation upon the subject, he frankly admitted that, so far as the public are concerned, they were useless, as no one but an expert can tell, without an explanation from some one who already understands them, the rates from one station to another. The schedule posted by the railroad company is alphabetically arranged, stations widely apart on the map being together on the schedule, and this arrangement somewhat increases the difficulty of travelers ascertaining the distances and rates. This, at least, is the result of my observations.

On the twenty-sixth of June, Commissioner Humphreys introduced the schedule which was adopted and is now in force, which established the rates of fare at the maximum of four and six cents per mile. This schedule was prepared by the Secretary of the Board. Accompanying it was an order enforcing it, and providing that when rates were then lower they should not be raised. For this schedule and order I introduced my schedule of a three-cent rate, and an order forbidding rates to be raised where they were lower than three cents per mile, as a substitute for the schedule and order presented and fathered by Mr. Humphreys. My substitute was defeated by a majority vote. I then moved to amend Mr. Humphreys' schedule by changing the rates therein to three and four cents per mile as maximum charges to be allowed, which was defeated, I alone voting

in its favor. Mr. Humphreys' schedule and order were then adopted by a majority vote. My vote was in the negative, and was given for reasons then stated. It appeared to me that the adoption of their schedules would be a finality, so far as fares were concerned, for a long time to come, and I did not believe (nor do I now), that the reductions thereby made were or are in any sense material.

WHY REDUCTIONS MADE ARE NOT MATERIAL.

It is a fact well known to the traveling public that the rates of local fare charged by the Central Pacific Railroad Company and its leased lines, between all of the thickly settled portions of this State, have for many years been less than five cents per mile, and where the travel is greatest it has been less than three cents. Local rates have been higher. But the railroad company have for years been selling "round trip," "family," and "commutation" tickets at rates greatly lower than those prescribed by the schedule now in force. Certain local rates have been reduced, and in some cases "round trip rates" also. But the great bulk of the rates have not been touched by this schedule; for instance, the company have for years been selling "round trip tickets" from San Francisco to Los Angeles and return for the sum of \$34. The distance is four hundred and eighty-two miles, making the round trip nine hundred and sixty-four miles. At the sum of \$34 for this distance the rate per mile is a fraction over three and one half cents per mile. The schedule rates over this route are four and six cents, and a single trip ticket bought by the schedule would cost the sum of \$21 70. The old rate for single trip tickets was \$23, or \$46 for the round trip. The schedule rate for single trip tickets reduces the old rate \$1 30 each way. This, on its face, is a reduction, but when the fact is stated that a very large proportion of the travel between Los Angeles and San Francisco is done upon round trip tickets, the apparent reduction becomes no reduction at all. The majority schedule rates make few, if any, reductions upon round trip ticket rates from San Francisco to any of the stations on the line of the Southern Pacific Road to which said tickets are sold, or from those stations to San Francisco. As the greater portion of the travel is done upon these tickets, the character of the reductions made can be readily determined. Upon local rates, between stations, the reductions are in many places material, but the reductions are invariably greater in proportion as the travel decreases. As showing the character of the travel and the places at which the heaviest reductions are made, I here insert an extract from a communication from A. N. Towne to our predecessors in office, dated January 5, 1881:

Upon looking the recapitulation over more carefully, we have made a further synopsis, showing that there were *forty-six* stations from which there were no passengers carried.

Eight from which the daily average was.....	30
Nine from which the daily average was.....	15
Six from which the daily average was.....	10
Seven from which the daily average was.....	15
Three from which the daily average was.....	8
Three from which the daily average was.....	1
Three from which the daily average was.....	30
Two from which the daily average was.....	15
Five from which the daily average was.....	10

Three from which the daily average was.....	3
Three from which the daily average was.....	10
Two from which the daily average was.....	10
One from which the daily average was.....	30
Three from which the daily average was.....	15
Four from which the daily average was.....	2

There were also forty stations to which there were no tickets sold, and there were:

Fourteen to which the daily average was.....	30
Eleven to which the daily average was.....	15
Eight to which the daily average was.....	10
Four to which the daily average was.....	15
One to which the daily average was.....	1
Six to which the daily average was.....	1
Three to which the daily average was.....	30
Two to which the daily average was.....	15
One to which the daily average was.....	10
Six to which the daily average was.....	1
One to which the daily average was.....	10
Three to which the daily average was.....	1
Two to which the daily average was.....	30
Three to which the daily average was.....	15
Four to which the daily average was.....	2

This list might be continued, showing many more stations that did not average one passenger a day either to or from.

Trusting the information we give you here may be of interest and entirely satisfactory, I am yours truly,

A. N. TOWNE,
General Superintendent.

These figures show that there are a large number of stations from which the travel was exceedingly light. The six thousand five hundred changes and reductions claimed to have been made by the majority schedule, include all changes to and from the points mentioned by Mr. Towne, and from which there was really little or no travel. Such reductions as these are merely on paper, and practically amount to nothing.

The following extract and exhibit was prepared by a friend of mine from a comparison of the majority schedule rates, and the reports furnished our office by the railroad authorities, and is self-explanatory. The figures are a fair average sample of the reductions made by the whole schedule:

RECAPITULATION,

Showing the receipts at each station on the three routes from San Francisco to Sacramento to every other station on these routes (exclusive of the Oakland ferry) for the month of May, 1883, calculated from the return for that month made by the Central Pacific Railroad to the Board of Railroad Commissioners; also showing the reductions which would have been made in those receipts had the schedule of the Railroad Commissioners been in operation in that month and no increase of travel been consequent thereon:

Station—From—	Estimated Receipts.	Estimated Reduction.
San Francisco (via Benicia).....	\$15,181 575	\$253 60
San Francisco (via Martinez).....	6,751 025	None
San Francisco (via Niles).....	5,221 60	11 40
Oakland Pier.....	2,665 40	56 90
Oakland, Market Street.....	324 30	None
Oakland, Broadway.....	256 60	3 75
Oakland, East.....	325 725	None
Alameda.....	23 85	None
Oakland, Sixteenth Street.....	1,575 50	32 30
Stock Yards.....	3 30	None
Stege.....	198 525	65
San Pablo.....	404 45	None
Martinez.....	1,420 10	10 15
Bay Point.....	36 45	1 90
Cornwall.....	411 40	6 90
Antioch.....	506 05	14 15
Brentwood.....	149 50	6 20
Byron.....	378 15	18 05
Bethany.....	69 00	1 65
Melrose.....	84 45	45
Elmira.....	664 10	60 20
Batavia.....	91 25	15 80
Dixon.....	1,006 75	57 70
Davis.....	1,243 25	182 35
Stockton.....	3,948 15	168 30
San Leandro.....	770 20	12 15
Haywards.....	1,562 70	9 15
Decoto.....	455 80	5 40
Niles.....	443 05	8 20
Sunol.....	268 30	50
Pleasanton.....	833 90	6 95
Livermore.....	1,350 05	46 10
Tracy.....	178 60	20 05
Banta.....	193 30	9 00
Pinole.....	224 85	5 20
Vallejo Junction.....	255 55	5 95
Port Costa.....	822 20	10 10
Benicia.....	1,918 35	88 60
Army Point.....	466 65	None
Suisun.....	1,255 10	249 95
Vallejo.....	2,388 90	64 55
Totals.....	\$56,230 90	\$1,444 25

The gross receipts of the Oakland Ferry for the year 1882, according to Mr. Goodman's letter to the Railroad Commissioners, dated April 10, 1883, were \$575,233 05. Take one twelfth as a probable estimate of like receipts for May, 1883 (they were probably much greater), gives \$48,019 75; which, added to \$56,230 90, gives \$104,250 65 for the total receipts for May, 1883. To get percentage of reduction divide \$1,444 25 by \$104,250 65—gives 1.383 per cent.

Mr. Goodman, the General Passenger Agent of the Central Pacific system of railroads, has also given us some figures which throw light upon this subject. In answer to questions concerning business of his roads and the rates of fare charged, he furnishes this information:

Local travel in the State, including ferries:	
Total number of passengers.....	7,366,525
Total miles.....	124,809,648
Total earnings.....	\$3,189,399 74
Average miles traveled per passenger.....	16.94
Average charge per mile per passenger, in cents.....	2.56
Same, excluding fares of the Oakland ferries:	
Total number of passengers.....	1,471,366
Total miles.....	70,206,844
Total earnings.....	\$2,613,165 79
Miles traveled by passengers.....	47.72
Charges per mile per passenger.....	3.72

Five sixths of the passengers transported over the whole Central Pacific system during the year 1882, were carried by the Oakland Ferry lines. Many of these passengers traveled upon commutation tickets, which are sold for three dollars per month, and calling the distance from San Francisco to Oakland eight miles, averages *five eighths of one cent per mile*. The single trip tickets are sold for fifteen cents each way, averaging less than two cents per mile. These low figures were taken by Mr. Goodman to make his average rate of two and fifty-six one hundredths cents per mile, and they applied to five sixths of the whole travel. It was before the adoption of the present schedule that Mr. Goodman made his estimates, and he then said that the average rate for local travel, excluding the Oakland ferries, was three and seventy-two one hundredths cents per mile. This estimate was obtained by taking all the local rates then in force, and in many places it was and is less than three cents; as, for instance, between Sacramento and San Francisco, and San Francisco and San José. The reduction claimed for this schedule is stated to be "more than thirty per centum of the rates superseded over and upon one thousand six hundred and four miles of road." This statement should be read in connection with the fact, that the rates are always reduced from and to points where travel is light, and that it is only claimed to be a reduction upon single trip fares and not upon "round trip" or "commutation rates," which are now, and have been for years, lower than the *maximum* prescribed by the schedule of the Board. The average rate of three cents and seventy-two one hundredths per mile, is *twice as great* as that *exact*ed over all the eastern roads doing any considerable volume of business, and in my judgment should be materially reduced.

Holding these views, and believing that the rates established by this Board's schedule were not "material," and not what they ought to have been, and the other Commissioners having expressed themselves as wishing to make further reductions whenever the necessity for them became known, I busied myself in the preparation of another "fare schedule."

It is thus referred to in the majority report:

On the nineteenth day of October, A. D. 1883, Commissioner Foote offered his first schedule of passenger fares, the same in form as that of Commissioner Humphreys, adopted on the twenty-sixth day of June, and applying to the same roads. It fixed a uniform maximum of three cents per mile for all of them and adopted the existing rates below it.

Mr. Carpenter certainly knew that this was not my "first schedule;" he certainly remembered that his vote and that of Mr. Humphreys had defeated one offered by me several months before. When he alludes to my schedule as "the same in form as that of Commissioner Humphreys," he certainly does not mean to give that gentleman the credit for either the arrangement or preparation of the one introduced by him. The work upon that was done by the Secretary, and the plan was that upon which the Central Pacific and other lines have always prepared such documents. The last schedule introduced by myself was argued at considerable length. I pointed out what I considered the failures of the one in force, and urged upon my associates the necessity for its adoption. It was prepared at my own office, and was upon the plan of the one introduced by Mr. Humphreys; not that I considered it necessary, but to meet objec-

tions urged against "resolutions" and the first schedule presented by myself. It was introduced together with an order for its enforcement. It was laid over for consideration, and finally, upon the sixteenth day of November, I called the vote upon its adoption. *I voted for it. It was rejected by the Board,* and since that time the question of fares has not occupied our attention.

FREIGHT REDUCTIONS PROPOSED AND ACCOMPLISHED.

The freight reductions of twenty per cent proposed by myself were defeated, as I have already shown. On the twenty-fifth day of June, A. D. 1883, Mr. Carpenter introduced an order to the following effect, for which I voted:

It is ordered that the Central Pacific and the Southern Pacific Railroad Companies, for themselves and leased lines, and also all other railroad companies having offices in the City of San Francisco, be and they are hereby required to appear before this Board, at its office in said city, on Wednesday, the twenty-seventh day of June, 1883, at ten o'clock of said day, then and there to show cause, if any they have, why reductions on rates of freights to tide-water, and thence to all interior points in this State, should not be made, as follows:

First—An average reduction of from ten to twenty per cent for moving grain to tide-water from the following interior points, namely: Willows to Roseville Junction, Yolo to Sacramento, Knights to Sumner, Curtis to Huron, Soledad to Arena, Eden Vale, and others.

Second—Such a reduction, not less than thirty-three and one third per cent on present rates, for carload lots of grain for seeding and feeding purposes, from points on tide-water to all interior points in the State, as shall make the rates on grain the same from and to the interior.

Third—The average reduction of present rates equal to twenty per cent on flour and mill-stuffs, from mills at tide-water, and other manufacturing points, to all interior points in the State.

Fourth—An average reduction of present rates equal to thirty-five per cent on all kinds of household goods and furniture, and on emigrants' movables in carload lots in all directions to all points in the State.

Fifth—An average reduction of twenty per cent on present rates for fence wire in carload lots to all points in the State.

Sixth—An average reduction of thirty-five per cent on rates for blacksmiths' coal, dairy and table salt, and other articles of the same class, in carload lots, to all points in the State.

Seventh—An average reduction of twenty per cent on the carriage of grain sacks, agricultural implements, wagons, and vehicles of all kinds to all points in the State.

Eighth—Why reductions on present rates for the transportation of wool, also live stock, especially in less than carload lots, should not be made. It is further ordered that the time for showing such cause as aforesaid shall be limited to said day.

I particularly direct your attention to it and the proceedings, thereafter following. It proposed a reduction upon grain rates from certain *interior points to tide-water, which have never been made.* The reduction proposed did not meet my views, but I voted for it because I was not able to get greater reductions made. In due time the companies to whom this order was directed, showed cause by written communications contained in the appendix to the majority report. They were published and widely circulated afterwards, in the form of pamphlets. They repay perusal, as they contain the reasons urged against a reduction, and in them the assertion is made that, all things considered, "fares and freights" are as low as they ought to be on these roads. From my examination of the subject, this conclusion is one which none but those financially interested in railroads have honestly reached. Mr. Carpenter, when upon the subject of freights, discourses at some length upon the subject of comparisons made, "equations of rates," etc. Shortly after the adoption of this order, Commissioners Carpenter and Humphreys employed General J. C. Sullivan, of Oakland, whom you will perhaps remember as the gentleman who did some work for the Board of which you were a mem-

ber. General Sullivan was not employed by the Commission, but by the Commissioners as individuals, and as I did not pay him any portion of the salary he received, I did not derive any benefit from his work. The comparisons he made were never presented to the Board, or shown to me personally, but that they were exceedingly valuable the freight schedule now adopted by the Board sufficiently attests. I voted for that "proposed reduction" under the impression that the changes that it made, so far as I had been able to ascertain, were in some respects material. If the vote were to be taken over again I should vote against it, because subsequent investigation has led me to the conclusion that it is not *really a bona fide* or "*material reduction*" of "freight rates" in any fair meaning of the phrase.

REDUCTION OF FREIGHT RATES PROPOSED BY G. J. CARPENTER.

<i>First</i> —On grain, including all the cereals, in mixed carload lots to all interior points:	
From San Francisco	35 per cent
From Port Costa	35 per cent
From Stockton	35 per cent
From Sacramento	35 per cent
<i>Second</i> —Flour and millstuffs of all kinds, in sacks and barrels, and mixed carload lots:	
From San Francisco	25 per cent
From Port Costa	25 per cent
From Stockton	25 per cent
From Sacramento	25 per cent
<i>Third</i> —Household goods, furniture, and farm utensils, and live stock, comprising the effects of a family, mixed carload lots, in all directions to all points in this State: thirty-five per cent.	
<i>Fourth</i> —Fence wire, nails, spikes, bar iron, flat and round sheet-iron, iron pipe, and horse-shoes and nails, in mixed carload lots, in all directions to all points in this State: twenty per cent.	
<i>Fifth</i> —Blacksmiths' coal and table and dairy salt, in carload lots, in all directions and to all points in the State: thirty-five per cent.	
<i>Sixth</i> —Grain sacks, bags and bagging, agricultural implements and vehicles, in mixed carload lots, to and from all points in the State: twenty per cent.	

By an order or resolution, adopted by the Board some time before, this proposed reduction was sent to the railroad officers, and they were to accept it within three days, and if accepted the railroad company was to use their own clerical force to prepare the schedules in accordance with it, and send it to the Board for approval. This reduction was accepted by the railroad company, and the work subsequently submitted to our Secretary for approval. As the majority report shows, Mr. Andrus approved the work, and Commissioners Humphreys and Carpenter adopted an order putting the schedules in force. The schedule prepared by the railroad company, to comply with the terms of Mr. Carpenter's "proposed reductions," consists of two hundred and thirteen pages, every page containing twenty columns of figures. This freight schedule is imposing in appearance, but for practical purposes amounts to but little. The "order to show cause," introduced by Mr. Carpenter, on the twenty-fifth day of June, 1883, proposed reductions upon grain from interior points to tide-water. His proposed reductions, upon the basis of which the schedules were prepared, *omits* this important factor. Mr. Carpenter's proposed rates are all upon *carload lots*, "straight" or "mixed." Goods shipped in less quantities than carload lots are not affected by the "proposed reductions," or the schedule, and herein is to be found the utter inefficiency of both.

The reduction of grain rates from the interior to tide-water are of more importance to the producing classes than any other subject which will ever come before this Board, in view of the fact that Cal-

ifornia now occupies almost the front rank as a grain producing State. For *one* ton of grain shipped from San Francisco to interior points there are more than a *thousand* tons transported in the other direction. Upon the *one ton*, which is charged for at exorbitant rates, there is a reduction, upon the *one thousand*, which is the product of the labor and time of the producer, *there is no reduction whatever*. Such a reduction is "like asking for bread and receiving a stone." A small farmer in the interior of the State, owning or renting one hundred and sixty acres of land, in a favorable season, will raise a crop of grain or other produce, which will fill ten cars of ten tons each. When he undertakes to ship to the market he is compelled to pay, *notwithstanding the material reductions* made by this Board, the same exorbitant freight rates which have been heretofore exacted from him. Now, the farmer who ships *ten tons* to tide-water will not likely ship *half a ton* from the other direction, and upon this half ton he gets no reduction, for the reason that the schedule makes no change in the rates except the goods be shipped in "carload lots." "*Blacksmiths' coal, table salt, household goods, the effects of a family,*" and some other articles, are reduced thirty-five per cent when shipped in "carload lots, straight or mixed." The beauty of this reduction is apparent, and forcibly illustrated, when it is known, as must be apparent, that such coal is needed only in small quantities, and a carload of "table salt" would last the people of the San Joaquin Valley from the present time, until the "saving grace" of this Commission preserves them from the wrath and extortion of the railroad authorities. Besides, it makes little difference to the producer what the rates are upon the goods which he himself ships from other points, if the rates charged upon the products of the soil are reasonable and fair. I might illustrate the defect of this freight schedule to an indefinite extent. The one given is selected at random from among many that occur to me.

The average local freight rates are more than twice as high upon the Central Pacific and other lines in this State, upon almost every article produced in large quantities, than those that are transported over eastern roads. The "volume of traffic," an argument often used by railroad authorities here, is in our favor, so far as local transportation is concerned. That reductions are imperatively demanded, and ought to be made upon such articles from "interior points" to "tide-water," or "shipping points," is a proposition too plain to admit of discussion.

COMPARATIVE ESTIMATES BETWEEN EASTERN AND CALIFORNIA ROADS.

As showing the comparative charges between the eastern and California lines, as well as the *ratio* of increase between *gross earnings* and *operating expenses*, I herewith present for your consideration certain figures, obtained from reliable (?) sources. The following table, taken from Poor's Manual for the year 1883, shows the gross and net earnings per mile of the Central Pacific Railroad, and the per cent of operating expenses to gross receipts from the years 1864-5 up to and including the year 1882:

Year.	Gross Earnings.	Net Earnings.	Per Cent of Operating Expenses.
1864-5	\$14,029 62	\$5,159 09	36.77
1866	11,523 58	2,676 31	23.22
1867	12,359 01	2,876 07	23.27
1868	7,630 43	2,782 73	36.46
1869	9,373 26	4,947 97	52.78
1870	9,060 87	4,462 87	49.31
1871	8,888 72	3,852 36	43.34
1872	10,349 18	4,335 01	41.88
1873	10,526 97	4,066 51	38.63
1874	11,193 28	4,332 35	38.71
1875	12,068 63	6,115 37	44.41
1876	11,925 76	6,411 93	46.23
1877	9,237 88	4,360 30	52.80
1878	9,031 87	4,505 27	50.47
1879	7,677 84	2,836 56	65.33
1880	8,312 98	3,442 28	62.77
1881	9,448 67	3,731 24	60.51
1882	8,436 95	2,814 53	66.64

This increase in the operating expenses to gross earnings is a system very much in vogue in the Eastern States as well as here.*

From Poor's Manual of 1883, I take at random the freight and fare charges on certain well-known Eastern lines, showing how much greater are those charges here than there.

On the New York Central, for the year 1882, the report is as follows:

Operations for the year ending September 30, 1882 (average 956.65 miles): Trains run (passengers, 5,448,929; freight, 10,912,064), 16,360,993. Total engine service, 23,907,884. Passengers carried (through, 207,496; way, 10,101,483), 10,308,979; carried one mile, 432,243,282; average distance, 42 miles; average number per train, 79; average fare, 1.80 cents. Freight moved (through, 2,106,707; way, 9,223,686), 11,330,393 tons; moved one mile, 2,394,799,310 tons; average haul, 211.36 miles, against 228.34 miles in 1880-81; average train load, 228 tons, against 217 tons in 1880-81; average rate per mile, 0.73 cents.

From the same source I learn that on the New York, Lake Erie, and Western road, the "total length of all lines operated in the year ending September 30, 1882, was 1,029.03 miles."

The operations were as follows:

Trains run (passenger, 3,546,055; freight, 8,569,938), 12,115,993 miles.

* In the month of February, 1883, Mr Towne sent to the office of the Commission answers to certain questions which had been sent to him at a previous date. From the original document on file in our office, I quote this question and answer:

Fourth—State the per cent of operating expenses as compared to gross earnings for each year since the road has been in operation.

Answer—The per cent of operating expenses to gross earnings each year, from 1864 to 1882, are as follows, to wit:

1864-5	36.77	1874	38.71
1866	23.22	1875	41.41
1867	23.27	1876	46.23
1868	36.46	1877	47.20
1869	52.78	1878	50.08
1870	49.31	1879	59.51
1871	43.34	1880	58.73
1872	41.88	1881	57.52
1873	38.63	1882	62.60

These percentages of Mr. Towne agree precisely with those in Poor's Manual down to the year 1875. After that date they differ widely. Which is wrong and which is right I do not undertake to say, but taking either set of figures they are not correct save in one or two instances. In other words, calculations based upon the operating expenses as compared to gross earnings, do not produce the results furnished by either Mr. Towne or those obtained from Poor's Manual. These figures are furnished to us as authentic, and upon which our official action is supposed to be based. They are deceptive, which illustrates the difficulties to be met, and the caution to be observed in acting upon statements which are of course tabulated with a design to present the corporation side of the question in the most favorable light possible.

Total engine service, 15,292,397 miles. Passengers carried, 6,784,195; carried one mile, 225,130,883; average rate per passenger per mile, 1.947 cents. Freight moved (general, 5,790,566; coal, 6,104,672), 11,895,238 tons; moved one mile (general, 1,343,313,585; coal, 611,076,125), 1,954,389,710 tons; average rates per mile, general freight, .722; coal, .808; all freight, .749 cent. Company's freight moved, 868,710 tons, making total tonnage, 12,763,948 tons.

On the New Jersey Central the following is the report for the year ending December 31, 1882:

Trains run (passenger, 2,510,263; freight, 4,243,047), 6,753,310 miles. Total engine service, 8,230,627 miles. Passengers carried, 9,239,211; carried one mile, 118,471,268; average fare, 1.861 cents. Tons freight moved, 7,726,235; moved one mile, 680,707,020; average rate, 1.269 cents.

On the Delaware, Lackawanna, and Western Railroad, the following is the report:

Total length of track on all lines owned, leased, controlled, and operated, 1,854.03 miles.

The following shows the operations of the line for the year ending December 31, 1882:

Trains run (passenger, 2,208,258; freight, 8,308,474), 10,516,732 miles; passengers carried, 6,070,329; carried one mile, 91,025,844; average rate per mile, 2.22 cents; freight moved, 7,452,757; moved one mile, 711,640,163; average per mile, 1.35 cents.

The Pennsylvania Railroad, one of the oldest and largest railway corporations in the country, including its second, third, and fourth tracks and sidings, operates five thousand nine hundred and six miles of road.

The operations of one of its divisions (they are given separately in the manual) for the year ending December 31, 1882, were as follows:

Passenger and freight mileage of engines (passenger, 5,097,229; freight, 15,236,589), 20,333,818 miles. Total engine mileage, 21,008,408. Passengers carried (first-class, 7,460,692; emigrant, 69,762; commutation, 2,842,440), 10,372,894; carried one mile, 245,971,772; average rate per mile, 2.374 cents; average distance, 23.71 miles. Freight moved (through, 1,944,819; way, 18,415,580), 20,360,399; moved one mile, 2,879,542,701 tons; average rate per mile, 0.817 cent.; average distance per ton, 141.43 miles.

The Chicago and Alton Railroad, operating eight hundred and forty-nine miles of road, reports as follows:

Operations for year ending December 31, 1882: Trains run (passenger, 1,550,018; freight, 2,513,523), 4,063,541 miles. Passengers carried (through, 123,600; local, 1,543,391), 1,666,991; carried one mile, 101,150,959; average mile rate, 1.95 cents. Freight moved (through, 772,975; local, 2,749,865), 3,522,840; moved one mile, 474,823,908 tons; average mile rate, 1.26 cents.

The Chicago and Northwestern operates three thousand two hundred and seventy-eight miles of road, and reports as follows for the year ending May 31, 1882:

Trains run (passenger, 3,999,677; freight, 9,003,377), 13,003,054 miles. Engines run, 18,157,257 miles; cost per mile run, 20.51 cents. Cars run (passenger, 19,801,642; freight, 194,547,302), 214,348,944 miles. Passengers carried, 6,754,717; carried one mile, 205,574,178; mile rate, 2.52 cents. Freight moved, 8,190,893; carried one mile, 1,192,188,039 tons; mile rate, 1.47 cents.

CENTRAL PACIFIC RATES.

The average rates for the carriage of passengers charged by the Central Pacific Railroad, as given by Poor's Manual for the year ending December 31, 1882, was 2.92 cents per mile, and for freight per mile, 1.81 cents. As I have shown from Mr. Goodman's letter, heretofore given, the average local rate for passengers is 3.72 cents per mile, excluding the Oakland ferry traffic. The Central Pacific is perhaps the only large corporation in the world which transports nearly five sixths of its whole number of passengers over a cheap ferry route.

The quotations made as regards other roads show that the Central Pacific charges nearly twice as much upon both passengers and freights as is exacted by eastern roads for the same services. *As a consequence, it has been enabled to earn more clear money per mile, upon a limited amount of traffic, than any one of six great eastern lines operating through a densely populated country.*

FURTHER ATTEMPTS TO SECURE REDUCTIONS.

The Central Pacific Railroad and its leased lines are the only roads in this State which have freight rates *not uniform in either direction*. All other roads have a *freight tariff uniform* in amount over the same road in either direction. The Central and Southern Pacific system exacts heavier rates on grain going from "tide-water" than on the same article coming from the "interior" to "tide-water." The discrepancy is based upon the argument, and said to be controlled by the fact, that the volume of traffic is greater on these articles from the interior than to it. The argument is fallacious and scarcely worth considering. From the facts herein stated, I unhesitatingly assert that the "freight reductions" made by this Board are mere deceptions and less "material" even than those relating to "passenger fares." Discriminations have been prevented in some instances, but allowed to remain unchanged in others. My own idea is that a reduction of twenty per cent upon local freight rates, upon all articles in either direction, in carload lots, or in smaller quantities, should be made now, and that discriminations found to exist in such a schedule could be eliminated therefrom as discovered; and to that end I introduced the following resolution shortly after Mr. Carpenter's "Proposed Reductions" were presented to the Board and adopted:

OFFICE OF THE BOARD OF RAILROAD COMMISSIONERS OF THE STATE OF CALIFORNIA.

It is hereby ordered that on all railroads and lines of transportation in this State, owned, leased, or operated by the Central Pacific Railroad Company, freight rates shall be and are hereby reduced and established as follows:

First—On grain, including all the cereals, from all interior points in this State to all other interior points, and to all tide-water points, in carload lots, straight or mixed, there shall be a reduction of twenty (20) per cent from the rates now charged per tariff books of June 1, 1881. Upon grain, in less than carload lots, the rates shall be reduced thirty (30) per cent in all cases from those now in force.

Second—Green fruit, in less than carload lots, where now rated as *first class*, shall be rated as *third class*, per tariff books on file in this office.

Third—Upon wool, from all points in this State, a reduction of twenty (20) per cent, whether shipped in carload lots, or in smaller quantities.

Fourth—Upon live stock of all kinds, in carload lots, to and from all points in this State, now shipped under special contract rates, there shall be made a reduction of twenty (20) per cent upon said rates as they are now charged.

Fifth—Upon beans, potatoes, flax seed, alfalfa seed, hops, onions, and mustard seed, between all points in this State, in either direction, and in any quantity, and irrespective of the classification which now obtains, there shall be a reduction of twenty (20) per cent from existing rates.

Sixth—Upon wood, coal, lumber, shingles, laths, brick, cement, lime, and ores of all kinds, to and from all points in this State, and irrespective of present classification, in carload lots, or in smaller quantities, there shall be a reduction of twenty (20) per cent from existing rates.

Seventh—It is further ordered that a certified copy of this order shall be immediately served upon said company, and if, within three days after such service, said company shall file a written waiver with the Secretary of said Board of Railroad Commissioners of the State of California, of a separate schedule, and printed copy thereof, and shall specify therein the time, not exceeding twenty days from the date of said service (unless upon good cause shown, said Board of Railroad Commissioners shall grant further time), within which changes of rates and reductions will be made and put in force, then, and in that case, said company may make such changes and reductions in its existing schedules, and post the same according to law, and in accordance with this order; provided that the company accepts this order, its schedules during preparation shall be open to inspection by the Secretary or any member of said Board.

It is further ordered, in the event that said company shall fail to accept this order within the time named, that the Secretary is hereby directed to prepare freight schedules as soon as possible in accordance with this order.

The principle of reduction provided for in this resolution was *uniform*. Its consideration has been postponed. In the majority report, Mr. Carpenter, in an allusion to other reductions proposed by myself, of the same general character, has this to say:

It follows that extortions and discriminations are not to be remedied by sweeping and perfunctory declarations that they exist and ought to be forbidden, but by reforming the rates in which they are found. To avoid the plodding processes of examination, it is possible to assume, without proof or knowledge, as is often done, that all are excessive, and therefore extortionate. But that all are unequal, and therefore discriminative, is a solecism too palpable to excuse on the score of any negligence or ignorance, and absurd as it is, it is no more so than the correlative proposition that unequal rates can be equalized and discriminations eliminated therefrom by uniform reductions.

From a fair consideration of this language, it will readily be perceived that the foregoing resolution will not be adopted by the present Board, and that no schedules will ever emanate from this office, based upon the principles which it contains.

The "perfunctory declarations" in this resolution (according to the majority report) are mere reiterations of facts known to exist by every intelligent man in the State.

The majority report contains this clause, referring, I presume, to the Commission or some member thereof: "That all are unequal, and therefore discriminative, is a solecism too palpable to be excused on the score of any negligence or ignorance." If this "negligence" or "ignorance" is intended as descriptive of the character or official conduct of the majority of this Board, I have nothing to say concerning it. Their report speaks for itself. If it is intended for me, it is not true, for I have performed my duties with as much zeal as any other member of the Board, and I think I have as clear a perception of the duties devolving upon me as either of my associates. In other words, my whole time for the past year has been devoted to the duties of my office. I have no desire, and this is not the method or the place, to indulge in personal controversies, but when such language is used in the majority report with reference to propositions made by me, I should be wanting in my duty to myself, as well as to the whole people, if I did not notice it in becoming and temperate language.

OTHER FACTS DEEMED IMPORTANT.

In addition to the "proceedings of this Board," an annual report of which to your Excellency is required, the Commissioners are required to report "such other facts as may be deemed important." Under this head the majority report contains a number of facts of interest, carefully culled from the reports made to the Board, and also some suggestions for the extension of the powers we now have. I concur in the recommendations made, and in the biennial report to be made next year to yourself and submitted to the Legislature, shall endeavor to make some further suggestions for legislative action, which I deem important. It is useless to make them now. The majority report gives the conditions of the roads in this State as regards efficiency and equipment, facts which can only be known from an examination of the reports submitted to the Board, as the Commission has made, thus far, but one official journey, and that only through the southern part of the State. My own observation from numerous trips made (I have only traveled on the Central Pacific and its leased lines), is that the road is generally in good condition, but the occurrence of fatal accidents is amazingly frequent. The service is not so efficient as upon many of the first class eastern lines, and the rate of speed much less than upon all first class roads.

The "sleeping car service," formerly under the control of the "Central Pacific Company," has been sold or leased to the "Pullman Company," and, as I am informed, the wages of the employes very greatly reduced—porters from \$40 to \$15 per month. This Commission has not been officially informed of these changes. The "Pullman Company" is, however, a "foreign corporation," and may not, however, be under the jurisdiction of the Board for that reason. That sleeping car accommodations might be construed, in these days of latitudinous construction of constitutional amendments, to be "a regulation of commerce," exclusively under the control of Congress, may or may not be the reason for the transfer of the sleeping car department of the Central Pacific system, to the control of another company.

I had intended at the outset to discuss the theory of "competitive" and "non-competitive points," as used in the arguments of the railroad companies, and given therein as a conclusive reason for making low or high rates. In this State the Central Pacific system has practically no "competition," as is known in the Eastern States, and the reasons which would be given there for lowering or raising rates, would be worthless as arguments here; and indeed the whole argument based upon the theory of "cutting rates" to "meet competition," is urged with a persistence which suggests that it is more plausible than real. *Railroads do not compete for traffic which does not pay a profit.* If "competition" lowers rates so that carriers by rail cannot transport goods at a reasonable profit, they cease to compete for business in localities where such competition exists. They do not carry freight at an actual loss. The well worn argument that "high *maximums* must be allowed in order that low *minimums* may be possible," has about subserved its purpose.

SECOND CLASS RATES.

The fare schedule adopted does not touch second class rates in any direction. Although this Commission is empowered, under the Constitution and laws, to fix "rates," and "rates of charge," there is some doubt of its power to order the railroad companies to sell second class tickets to and from all stations on their lines of road. I shall shortly propose measures in the Board to test this question, and if it is determined that the power does not exist, shall, in my next report, suggest some legislation which will enable us to control the subject. If the power is intrusted to us it should be exercised, for the evils to be remedied are many and notorious. I have conversed upon this subject with the official controlling this matter for the Central Pacific system, and in reply to my question as to why second class tickets are not sold to and from all points on the lines of road under his control, he said that if this were done "everybody would travel second class." This answer is the key-note to the whole subject. From San Francisco to Sacramento, Los Angeles, and other *competing points*, and from all these points to San Francisco, *second class through tickets without stop-over privileges*, are sold at a very liberal discount upon *first class rates*. From intermediate points between those named, where there is no other public mode of conveyance, except the railroad, *no second class tickets* can be purchased in either direction. Second class cars are run by these stations on every through and upon some of the local trains. A traveler can purchase a first class ticket at these stations and ride in a second class car, but no second class tickets are for sale by the railroad agents. This is a policy which has created much harsh feeling in the San Joaquin Valley and elsewhere against railroad management. It ought to be changed, either by order of this Commission, or voluntarily by the railroad authorities.

In the brief time allotted me in the preparation of this report (from the seventh day of January, 1884, to the date hereof), and with no knowledge of the contents of the majority report except such as was afforded me by the perusal of the hasty transcription made by our Stenographer, it has been impossible to present to you many phases of the "transportation question," which are well worthy of notice and discussion.

I will not close this, however, without some reference to the

POLITICAL METHODS OF CORPORATIONS IN CALIFORNIA.

This is a subject with which your long service upon this Board, and your candidacy for and election to a higher position, has doubtless rendered you somewhat familiar. It is currently reported and generally believed, that certain of the railroad companies of this State have regular political agents employed, at high salaries, to obtain favorable legislation and accomplish other purposes of benefit to the corporations which retain them. It is of course perfectly natural that corporate bodies should desire to protect their interests; but this should be done in an honorable and in a legitimate way. Furnishing "solid reasons" for political action or official action of any kind, is a species of argument not longer to be tolerated, if good government and free institutions are to be maintained and perpetuated. In what

has hereinbefore been said, I make no personal allusions other than where they are plainly intended and the individuals actually named. I arrogate to myself no more of skill, and claim no greater degree of honesty than I accord to others, for I have not discussed the question of motives, but have simply endeavored to state the facts.

The money allowed the Board for contingent and traveling expenses, by the last Appropriation Bill, has been judiciously and economically expended. The whole sum was \$2,500; \$1,500 of this amount was specifically appropriated for traveling expenses of the Commission for the two years ending in 1884. Less than one tenth of this sum has thus far been expended.

All of which is respectfully submitted.

W. W. FOOTE,
Railroad Commissioner, Third District, State of California.